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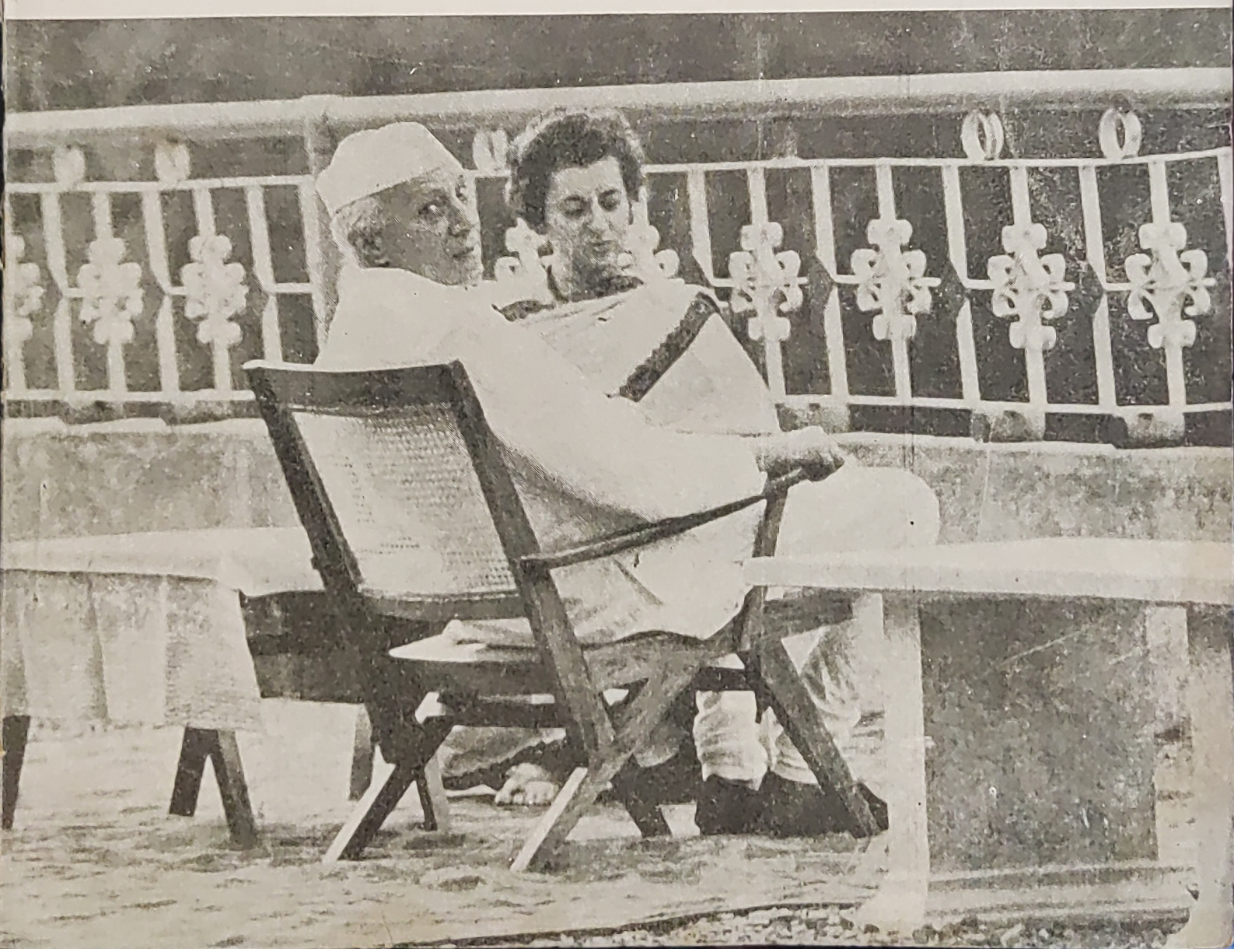
Indira Gandhi—The great environmentalist with her father.

Photo—Brahm Dev, 25th May, 1964
Sahastradhara, Dehra Dun.



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Uttar Pradesh's
GRAND ATTRACTION

For Lovers of Wild Life
CORBETT NATIONAL PARK
DUDWA NATIONAL PARK
VALLEY OF FLOWERS NATIONAL PARK

CORBETT NATIONAL PARK is famous all over the world for its scenic grandeur and its wildlife—elephants, tigers, deer (several species) and a host of other mammals, birds and reptiles—the Ghariyal and magar and the mighty "Mahasheer fish".

DUDWA NATIONAL PARK is famous for its biggest surviving herd of 2600 swamp deer besides Tiger, Spotted deer, Sambhar, Hogdeer, Barking deer, Sloth bear, Wild boar, Marsh Crocodile and hundreds of innumerable birds. It is also now a home of Great Indian One Horned Rhinoceros introduced recently.

VALLEY OF FLOWERS NATIONAL PARK is an alpine valley nestling in shadow of snow peaks full of lush vegetation during monsoon. The valley remains in bloom for three months. The important vegetation consists of Rhodendrons, Primulas, Potentillas, Saxifrages, Marigold etc.

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as a result of urban development activities, there was a ready response and the matter had to be looked into urgently. The peafowl in Teen Murti House, where she spent more than 16 years with her father from 1947 to 1964, always engaged her attention. Earlier this year, she wanted to know whether their roosting places were adequate and whether the population had dwindled. She was statisfied only after a special investigation was carried out and the necessary steps were taken.

It is this concern for the world of nature spanning a period of two crucial decades which account for the fact that New Delhi can still boast of peafowl and partridges living naturally in harmony with the fast increasing human population.

In connection with the rare Siberian cranes, an interesting episode is worth mention. In November 1983, the Non-Aligned Summit was held in Delhi and Mrs. Gandhi was unanimously elected as the Chairperson of this conference. Despite the obviously pressing duties and responsibilities in this capacity as well as playing host, Mrs. Gandhi took everyone totally by surprise by finding time to have a meeting with the President of Pakistan and the Prime Minister of Afghanistan to discuss the question of affording adequate protection to the Siberian cranes in those countries during their migration to and from India. No one had briefed her about this, it was obviously the result of her genuine interest and concern as well as her amazing capacity to manage her time. No wonder when the first Siberian crane was born in captivity at the International Crane Foundation in Baraboo, Wisconsin (USA), it was named 'Indira'.

Time management was indeed one of her many amazing attributes. She always seemed to have time for everything. Conservationists and nature lovers were always welcome to meet or write to her. When she presided over meetings of the Indian Board for Wildlife or its Standing Committee, she was most patient and heard everyone, giving an impression that nothing else mattered. As Member Secretary of the Board throughont this period, I felt guilty taking so much of her very precious time. But, she never hesitated in giving time for meetings and then participating fully.

Between 1980 and 1984, which was the period of Mrs. Gandhi's second tenure as Prime Minister, she was the Chairperson of the Indian Board for Wildlife as well as its Standing Committee. It was during this period that a number of initiatives were taken specially for the conservation of birds. An Expert Committee of the Board on Birds was established for the first time, under the chairmanship of Dr. Salim Ali, for whom Mrs. Gandhi had great respect and admiration. She called him "the father of the conservation movement in India" and the first National Award for Wildlife Conservation instituted by the Indian Board for Wildlife was presented to him in 1983 by Mrs. Gandhi herself.

It was during this four-year period that there was a phenomenal increase in the number of wildlife reserves in the country. National Parks increased from 19 in 1980 to 52 in 1984. The famous Keoladeo Ghana Bird Sanctuary at Bharatpur was made a national park and Pulicat Bird Sanctuary in South India was saved from despoliation. There are now 30 national parks and sanctuaries in India established specially for birds.

Perhaps the most notable success during this period relates to India's participation in international conventions and conferences dealing speciafically with birds. India signed and ratified the Convention on Wetlands of International importance specially as Waterfowl Habitat (Ramsar Convention) and the Convention for the protection of Migratory Species of Wild Animals (Bonn Convention) at this time. This was entirely because of the support received from Mrs. Gandhi. She gave similar support to the idea of an agreement for the protection of migratory birds between India and the USSR, which was originally proposed by Dr. Salim Ali in 1971. A few days before her death, this convention was finally signed in Moscow.

Mrs. Gandhi's deep interest in birds is evident also from the following statement made by her while inaugurating the centenary celebrations of the Bombay Natural Society in September 1983.

"The flight of birds is itself an expression of the desire to be free and to rise high above the mundane. Such natural phenomena have provided stimuli to technological innovations as well as for artistic creative genius".

Bird lovers, not alone in India but also in other parts of the world, knew that they could write to Mrs. Gandhi about their problems and get her attention. This was typical of her and this is what will be missed most by this community. Their's is a loss verily beyond repair, for there will never be another like Indira Gandhi.

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DO YOU KNOW ?

— Cranes are the world's tallest flying birds standing 2 metres high.

— Storm petrels are the smallest and most delicate of all sea-birds.

— The Harpy eagle is the most powerful bird of prey in the world. It is up to 1 metre long, its wingspan is more than 2.5 metres.

— Capyhara is the largest rodent in the world standing over 50 cm in height and weighing over 50 kg.

— The Andean Condor is the largest bird of prey weighing about 12 kg and having a wingspan of 3-2 metres.

— The Anaconda is the largest snake in the world. It is over 9 metres in length and weighs around 150 kg.

— The Crested Argus Pheasant has the largest tail feathers of any wild species of bird (CEE-NFS).

2. *Pinna Region*

The hair inside and outside of the pinna are white and light brown in colour. They are thin and scaly in texture. The cortex of the hair which are distributed inside the pinna is pigmented but the medulla is dark tan in colour. In the case of hair of the outside part of pinna the cortex is pigmented whereas the medulla is less pigmented.

3. *Eyelid Region*

The hair near the eyelid are thick dark in colour whereas in the muzzle region they are thin and comparatively short. The cortex of the hair near the eyelid is pigmented than the medulla. The cuticle is scaly in texture in the case of hair of the muzzle the cuticle has a scaly layer and shines in light. The cortex is densely pigmented and appears dark tan in colour, whereas the medulla does not show pigmentation.

4. *Nostril Region*

The hair of the nostrils are thick and deep black in colour and are pointed at their distal end. The cuticle is scaly and the cortex and medulla are not distinguishable. The medulla, however, can be noted at the distal end of the hair.

5. *Chin Region*

The hair of the chin region are thin, long and dark in colour. The cuticle is scaly and rough. The cortex and medulla are distinguishable only in the middle region of the shaft. The pigmentation is loose and sparse.

6. *Neck Region*

The hair of the neck region are dark black in colour, thick and long. The cuticle is scaly and the the cortex and medulla can not be distinguishable due to deep pigmented area.

7. *Dorsal Ridge Region*

The hair of the dorsal ridge region are thin and light brown in colour. The cuticle is scaly and rough. The medulla and cortex are distinctly marked by a transparent layer in between them. The medulla is dark colour whereas the cortex is light pigmented. At the top of the hair shaft, however, these regions are so condensed and pigmented that they can not be distinguished from each other.

8. *Abdominal Region*

The hair on the lateral abdominal region are thin and creamish in colour. The cuticle is scaly and clearly visible. The cortex is tan coloured and the distal tip region shows granules. The medulla is light black in colour and granules are absent on the tip region.

The hair on the ventral abdominal region are thin and short. The hair are creamish in colour. The distal tip region is, however, tan in colour. Cuticle is scaly and smooth. The cortex and medulla are not clearly distinct. The cortex is tan coloured and the pigmentation in distal tip region becomes darker. The medulla is covered by pigments.

9. *Thigh Region*

The hair on the thigh region are thin. The proximal region is creamish in colour, the middle region is light brown and distal tip region is tan in colour. Cuticle is scaly and shiny. Cortex and medulla are clearly visible and are dark tan in colour.

The hair on the inside this region are long. The proximal and distal region are creamish in colour while the middle region is tan in colour. Cuticle is scaly and rough. In cortex the pigment granules are light in proximal region while in distal region the granules are loose and closed together. The medulla is clearly visible and black in colour.

10. *Leg Region*

The hair above the knee are semi-thick and dark tan in colour, while the distal tip region some are light tan in colour. Cuticle is scaly and smooth. Cortex is clearly visible. Pigment granules are loose and tan in colour. The distal tip region some granules are light tan in colour and not so closed.

The hair below the knee are thin, short and white in colour. The distal tip may have light tan colour. Cuticle is scaly and rough. Cortex pigment granules are loose and tan in colour. The distal tip region show light colouration. The medulla is clearly visible up to distal region.

11. *Tail Bush Region*

The hair on the tail bush region are thin, proximal and distal region are tan in colour. The gut from medial region become much thinner up to distal tip region. Cuticle is clearly visible. Cortex is visible only in distal region. Pigment granules are tan in colour in proximal and medial region and light tan in distal region. Medulla is visible only in distal region and is dark black in colour.

Remaking of the Himalayan Trout Waters

By

S.B. Raizada

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(Continued from the Cheetal—Vol. 27, No. 3, Page 13)

Alternatives:

This may appear an ominous gigantic task and an expensive fruitless effort to revive trout fishery merely as an sport attraction to a few anglers, who in India constitute a negligible percentage of outdoor recreation participants. The notion is wrong. It may be borne in mind that even without reviving this fishery the balancing of the eco-system is a must. The fertility and richness of water going down the lower hills and then into plains is that what is made higher up in the mountains, and therefore we must embark to restore the system, and this fishery along.

During the passage of past 80 years there is a world of difference in the approach and quality of trout fishery. Demand for trout as a prized table fish has gone up many times and angling as recognised important sports. As a result of this, improved and mechanised commercial farming practices have been introduced including high energy artificial feed; depleted fishery of overfished streams have been put back through the application of scientific management and culture practices. All this to earn a respectable foreign exchange. This approach of heavy demand is being experienced in India also, in hills as well in places where foreign visitors stay.

Approach to achieve this end can be grouped under four main tasks:

1). Improvement of eco-system,
2). Adoption of improved culture practices,
3). Application of improved technology, and
4). A change in the administrative approach.

The first task is beyond the command of fishery personnel to deal all alone but involves several related agencies. This needs educating the masses for a shift in social behaviour in relation to the eco-system related to fishery. Catchment vegetative cover, particularly in areas that drain excessive silt, should be regenerated. Locality of erosion should be identified and phasewise conserved (this needs scanning inner areas also). The task becomes more important where road construction is in progress or is proposed in a future plan. Wanton removal of rocks from grasslands for building or other purposes should be halted. Stone

and rocks imbeded in soil also help in retaining and building surface layer. This work can be summarised into:—

i) Protective plantation in the catchment: for this purpose plants suitable to a particular locality should be identified/selected in such a way that they have fast growth and prove economical. Gully in catchments that slowly develop into larger creeks should be timely checked from enlarging, by protective check-dams and brush wood plantation, aligning seasonal drains, constructing support walls etc. (especially those close to road works).

ii) Vegetative stabilization of water banks: Use of *Alnus* and *Salix* should be profuse in the proximity of water course. Two species of *Alnus* are available in the country. *A. nitida* in western and *A. nepalensis* in the eastern Himalaya. These grow well up to a height of 2000 metres. *A. gultinosa* can be imported from Europe for more severe cold areas. This plantation may remain interspersed with *Ulmus* spp., walnut and other wide leaf plantation. The undercover to be kept stable with brush wood.

iii) Technical stabilization of water banks: can be achieved, where necessary, by erection of stone crate works. This method can be resorted to create riverine pools also.

iv) Torrents: though can not be technically removed from a certain topography completely but their impact can be technically retarded and minimised by protective works, stabilization and gully pluging.

v) Grazing: restriction on grazing and movement of wide hoofed animal, such as buffalo that cause fissures in soil in higher reaches, should be strictly imposed. These small fissures grow into large slip areas (such an example is Chhaki stream in the upper catchment of Kullu district of Himachal Pradesh, that turned an ideal trout stream into a barren stream). Domestic pigs also dig surface soil and should be restricted from free movement.

vi) Buffer zone: A zone of 30 to 50 metres deep forest/plantation along the river banks be declared buffer zone that is restricted for human habitation, industry and even agricultural purposes. This will reduce pollution and physical disturbance while helping restore the eco-system.

2) **Adoption of improved culture practices:**

As told earlier the science of Salmonid farming has reached great perfection along with the great changes in applied technology (referred to in subsequent item). Great improvements have been made in obtaining disease resistant, faster growing strains, reducing

the period of hatching and obtaining mono sex progeny is perfected and therefore it is not an improbable task to apply remedial measures of putting back trout to demand level. The prevailing circumstances establish three positions on culture improvements:—

i) The dwindling and constructed nursery has to be alternatively created or culturally compensated.

ii) The planted fry get damaged at the fall of monsoon if planting of fry is made directly into rivers. This therefore calls for alternative methods of release into natural waters.

iii) Demand for trout has gone up several folds including that for table as against the lone angling demand of yesteryears. This invites augmentation through means other than normal viz. Commercial farming.

These can be accommplished in one and several ways. Adoption of only Brown and the Rainbow for all cold waters is an incomplete coverage. The strain of Rainbow trout in the country is the migratory 'steelhead' and this has proved a failure in India. Non migratory and fast growing strain will have to be introduced. Similarly, *Salmo trutta locustri* and *Salvelinus namaycush* for high altitude lakes and the Rainbow for comperatively warmer and spring fed lakes (15° — 20°C) should be attempted; Brook trout (*Salvelinus fontinalis* or Golden trout (*Salmo gairdneri aguobonita*) for extreme but stable cold waters such as the Yumthang in Sikkim and Pin of Himachal Pradesh, should be tried for a utilitarian propagation.

As described earlier, the trout fry were planted in the water cress thicket channels. These channels besides being encroached, their water cress is extensively removed as green eatable. This should be legally stopped or controlled as forest produce or under the Wild Life Conservation Act, 1972, or under new provisions added to the Fisheries Act. More channels can be created, passsing through forest thickets. In the yesteryears survival of trout progeny from green to fry emergence was 30 to 35% on having remained infected heavily with fungus. But the practice of selective breeding, regular sorting of infected and dead eggs, treatment against infections, constant and machanically regulated hygienic water supply have reduced mortality to near neglibible figures. Time period of hatching should be regulated on maintaining water temperature and water quality so that the progeny is available in March; or reared up to September, to save against monsoons and hard winters. These saving methods on time and cost should be adopted to produce more and healthy progeny. Balanced and regulated feed such as would contain low fat, high protein, carbohydrate, mineral and vitamin constituents of desired level be prepared and broadcasted @ 10% of the body weight in the beginning and then coming down to 6% at about September. Feed for rearing young fry, raising of brood stock and commercial stocks should be distinctly

prepared. Consumption, utilization and utility at the prevailing temperature, wastes left and weight gained at given period should be regularly observed. Hatchery water supply for this purpose should be from springs or treated under pressure heaters and filters to maintain temperature between 15°—20°C, as per prevailing requirement, specieswise. It is to be remembered that parent brood stock raised under low water supply, at low temperature, poor feed, delays maturation processs and results into low fecundity and at the end a weak progeny. Water demand of all salmonids runs at an average of a litre or more per minute per kilogramme body weight of fish.

The fry thus derived in March (as against usual period of May/June) should not be shifted to streams or channels but reared into fingerlings up to September month, in circular vats or raceways, fed on high protein feed obtained from crustaceans (an ideal constituent is found in dried shrimp available all over the country, but in abundance in eastern India). Rearing in regulated water arceways and circular vats acclimatises the feeble live stock to natural stream conditions. The release at the end September or early October in India ensures of the end of killer monsoon. Release of fingerlings should then be evenly and thinly, directly into steams, @60-70 fingerlings per one kilometre stream of one metrewidth, of stable nature, Indian streams at an average are 50 metres wide and therefore 3500 to 4500 fingerlings per kilometre would be the demand. This method makes available a clean span of nine months before the next monsoon. This period of release also coincides to the approach of the fasting period of the fish and when the stream ferocity is on the decline. Thus, leaving a stock surviving in nature to more than 50%. To get 1000 fish under the former system of planting, 33,000 to 1,00,000 fry were needed to be derived from at least 40,000 to 1,30,000 eggs. Against this a meagre 6,000 fry, including mortality premium to raising fingerlings at farm, under the proposed practice would be sufficient. Thus saving a great deal on time and money. Some countries adopt a practice of release and catch in which 2 year grown stock is annually released into streams for a direct catch by anglers. This is an expensive proposition under the prevailing economics of maintenance, the facilities available and the priorities of trout culture in this country. Also, this method is not an ideal replacement to sport.

Increased recruitment demand of trout removed on exploitation by fishing from streams can be thus met with on high survival returns. But commercial demand is largely a farming effort that, beside culture improvement, entails technological improvements discussed in the subsequent item. Fish as product of commercial demand should be of high quality in taste and a quickly growing return. This comes from selective breeding, selective sex culture, easy convertibility of feed into flesh, cheap feed from local ingradients, making appropriate use of water etc. etc.

Size of table trout is usually preferred under the group 250 gms to a kilogramme. An year to one and half year raising cycle is a reasonable period. Sex, for taste has no difference but the stock for table should be removed before the body starts utilising energy into development of gonads. Sex selection for brood stock should be in a ratio of 40 to 60 of males to females. This is now achieved by action of ultra-violet rays and temperature control on genes. This helps in near accurately estimating stock requirement sex wise and avoid unnecessary efforts and expenditure.

3. **Application of improved technology:**

Advanced technological application is basically for higher outputs at the best utility of inputs. The individual job components under this aspect are meant to provide facility to this end. In salmonid culture this is to be achieved on control of water supply, efficient designs of structures such as the hatchery and the different kinds of nursery and rearing ponds and the control on feed.

Water Supply: Industrial pollution does not, so far, constitute a menace in the trout zones of this country as is the case in Europe and America where at several places the water condition is so acute that the same water is circulated and recirculated after treatment through mechanical devices as no pure water can be dreamed of owing to high industrialization of hinterlands. But, on the other hand these water in India are borne on an unstable land mass of heavy monsoon drainage and denudation (more acute during recent times). And therefore effective dissilting and then filteration structures designed at per cubic metre water flow is must. Dissilting is more effective in baffle tanks. Filteration should be through chemically inactive material (allum and chlorine should not be used). A passage through limestone and filter laid with grit, charcoal and sand is beneficial. Spring source water that is free from contamination all the year round and stable in temperature can be best used by passing through limestone grit and if very cold then pressure heated. But in all cases treatment of water for affective utility is a must.

Hatchery: Existing hatcheries in the country have an ordinary ova house having hatching boxes in the size mentioned on page 4. The capacity is to treat 16 to 20 thousand eggs per box. This brings an average treatment capacity of less than 4,500 eggs per square metre of hatchery building space. Against this it can be increased to 1,25,000 eggs per metre or more per unit space when equipped with modern hatching equipments (author has successfully designed a circular vat that can treat eggs and fry in the same structure and thus eliminating the requirement of hatchery and nursery as separate units).

Tanks: Existing pond structures in India continue to be outdated and have a capacity of 1 to 2 kilo. livestock square meter, for their structural design is incapable of keeping water movements efficiently and driving out of the excrements. The water supply

into these tanks is thus not on stock demand. The capacity should be raised to about 15 kg per square metre by applying design improvements of inlets and sloping raceways so that no dead water corners are created, no whirlpools formed, the inlet and oulet are commensurating and capable of affectively removing nitrogenous and faecal matter out. Any accumulation of such matters depletes oxygen and promotes disease bacteria and then the chances of contageous diseases runs high. Such ponds for fattening and brood stock building can be 3 × 10 m wide and 30 to 50 metres long with one metre depth and the sides sloping to 1 in 2. Their outlets are regulated that keep water flow up to base level.

Circular ponds for fattening, designed on centrifugal force operation, usually in size 6½ metre dia., though operated in most countries, have an inherent drawback of causing to rotate the nirogenous products, released by fish, at a certain level—usually at 1/3rd distance from periphery, for a long time. This reduce its effective utility. The effectivity of these ponds can be raised by applying baffles and deflectors in the body of the tank structure to keep water in such circulation that recirculation of released metabolised products is minimised. and more fish can be reared.

Fish handling: Handling of trouts at various stages is more frequent than most other fishes during culture, treatment, tranportation and disposal process. Such manual hanlding is more so in India. Mechanised devices for sorting, grading, stripping, feeding and chemical treatment should be adopted. Injuries thus avoided reduce infection. Salmonids suffer the most on this account. Insulated devices made of synthetic material for transportation of eggs, fry and other stage livestock are more easy to handle over long and arduous distances. Proper handling of marketable product is also essential so that consumers receive this product in fresh and presentable aesthetic conditions than in the unhygienic manner our food products are usually dealt with.

Feed: Like water, feed is the other limiting factor in trout propagation, whether it is for commercial or replenishment in open water. The old practice of feeding on expensive mutton mixed with various grain flour had no nutritional base and is more expensive to think of under prevailing conditions of vast demand on the purported production of trout. Trout waters of India are away from sea belt making it difficult for a regulated supply of fresh trash fish as part of wet diet. The riverine trash fish produce is incapable of meeting the high demand. Therefore an entirely dry feed, absolutely rich that may compensate for the disadvantages of the absence of wet diet, is must. However some region may bear such a wet diet. Commercially unimportant fish such as Labeo dero, L. diplostomus and Schizothorzocin is available in some upland reservoirs, such as in Himachal Pradesh. This produce is maximum during summer months coinciding with the maximum feed demand period. Their timely storage in hot climate would go a long way.

The feed should basically consist of (adjusting to the mineral richness of water available in an area) fat 5 to 8%, carbohydrate 9%, protein 45-65% (higher side in the diet of fry). Protein derivative should be more of animal origin and lesser from vegetable, say in an approximate ratio of 70 to 30% respectively in fry feed and 60 to 40% in others. A higher vegetable protein in mix needs additional mixture of amino acids. Recommended constituents to the base ingredients are:—

1) Mineral ..... app. 2%
2) Salt 2-4%
3) Vitamin A ..... 8,000 to 10,000 IU per kilo feed.
4) Vitamin D ..... 1,000 IU per kilo feed.
5) Vitamin C ..... 500 mg ,, ,, ,,
6) Vitamin E ..... 125 IU ,, ,, ,,
7) Vitamin K ..... 15 to 20 mg per kilo feed.
8) Iodine is recommended in traces of 0.0006 to 0.0.11 mg body weight of the fish.
9) Vitamin B1, B2, B6 and B12 are derived from Thiamine, Riboflavin, Pyridoxine, Cynocobalamine. The other adds recommended are: Biotin, Inositol, Pantothenic acid, Folic acid, Choline, Asoorbic acid, Paraminobenzoic acid, Alpha-tocopherol, Niacin etc.

Pigmentation with carotenoids to derive natural fish flash colour is obtained from a mix of crustacian wastes. Vegetable pigments are not affective on most salmonids.

In India all these constituents are available as ingradients of high quality products: Fish meal; bone meal; meat meal; liver med; blood meal; dried shrimp and prawn wastes; fish oil (animal grade); yeast (inactive); dried skimmed milk (as binder); vegetable protein and carbohydrate products as wheat, bran, rice bran, barley and soya bean flours, soya bean meal; salt; vitamin and mineral mix are available from standard manufacturers who have the capability to manufacture and supply these life essential constituents to the demand ratio.

Fish feed grinding, crushing mixing, pelletising and drying machines are available within the country or can be fabricated, of which we should be proud of now that these did not exist during those forgone days.

The feed should be grounded into granules for fry and pellets ranging 2 mm, 3-5 mm, and 8 mm size for fish aged 6 months, to a year then 1-1½ and above respectively. That the feed could be affectively obtained by the fish, it must not sink fast into water column and therefore this aspect should be taken care of during hydrolysation.

The moisture laden climate of these altitudes in our country, especially during monsoons and winter, causes spoilage and drainage of constituent values. Bone meal, salt and yeast are of hygroscopic nature. Proper storage silos should be made use of and chambers properly circulated with dry air and exhausts. Longer storage also drain down the values, particularly the vitamins, and therefore the overages should be added and stocks for use in a month or so only should be accumulated.

4. **Change in administrative approach:**

A thorny cause Of low profile development of trout, as also the other fishery in the high mountains, is the apathy on the part of the administration perhaps on their ignorance of the important role this fish could play, directly and indirectly, as a spring board to the economy of these backward and far flung areas beside earning a valuable foreign exchange. Present behaviour is in whole contrast to the administrative approach of the times when this fish was introduced. Therefore administrative realization is necessary at:

1. Planning stage,
2. Execution and working stage, and
3. Co-ordination in general administration follow-ups.

In the first instance propagation plans should be cleared timely allowing also a necessary working force. This would permit full use of idle resources that are variously suitable to general and commercial propagation. In the general administration fisheries should be co-ordinated in controlling pollution, removal of encroachments, planning of river bank, forests etc. Fisheries legislation should be made realistically effective.

Conclusion: It is a pertinent point that the fishery of trout was rich in this country when the tecnnique was primitive and the means limited but the ecological order was favourable combined with the devotion of workmen who brought the fish from distant lands into the deep Himalaya when the means of communication were non-existent. The Himalaya is a young earthmass by and large sedimentary rock formation, pounded by two to four metres or more of rainfall every year. The forest cover gives stability by holding down the impact of rain and cause water absoption into soil, contain the run-off and thus save erosion. The roots hold soil and those close to river bank have an additional task of enriching the bio-mass. This balance is now completely reversed.

It is now imperative to remember that trout potential areas yet exist extensively over the Himalaya and more are being identified, and much larger being added every year in the shape of reservoirs, lakes and canals but only a small section of this has come under trout propagation. This technology has advanced tremendously and trout demand increased several folds. This has earned the reputation of being an important export material

beside being a much sought table fish within the country. The known resources alone can be utilised to produce more than 3,000 metric ton fish of a value of more than 90 million rupees in direct terms beside the benefit it grants in other terms of tourist industry. On making use of the improved technology, much more can be achieved. The need of the time is therefore not only the application of new technology but the regeneration and restoration of the ecological order and adjustment of the methods of application to the changed circumstances of demand; and adjustment and improvement of techniques to the Indian conditions.

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Bobby Selects Her Home

J.P. SINHA

[One of the four cubs of a Tigress, apprporiately named Bobby, in consideration of her grace, gaits and beauty, was born some thirty four months (as on June 1986) ago in the forests of Betla that forms the Tourist zone of the Palamau Tiger Reserve in Bihar. Her present habitat and resultant danger to which she is exposed on this score was the subject of study. The study brings out the urgency of further study of the behaviour of Bobby.]

Description of birth place of Bobby

1. The forests where Bobby was born, are deciduous made up of Sal, Asan, Kend, Piar, Salai, Dhaura, Kaji, Khair, Bel etc. Almost the entire area is covered with bamboo—in fact, bamboo often forms pure patches on extensive area. Teak and Eucalyptus plantations raised in the sixties and earlier, occupy some areas but in small pockets only. The teak plantations are, however, extensively damaged by elephants during their visits to the forests where they spend their winter, though this year (1986) they stayed till the month of April. The Teak plantation will not however survive for long as the elephants seem to have preference for Teak trees which they damage extensively. The Eucalyptus plantations are suffering from gomosis; they are lanky and keep on dying year after year.

2. The entire area is hilly except the southern part that merges well cultivation. Valleys within this forest are narrow. There are many caves in the area and a few lie on the top of the hills from where fairly large areas may be scanned. Often the tiger has been seen occupying these caves. The river Auranga forms the Eastern boundary of the Betla Tourist zone that contains water all through the year. Adjoining to this is also a artificial reservoir known as Kamaldah that provides water all through the year. Apart from these the entire area is covered with well distributed water holes which contain sufficient water during the summers.

3. The area contains variety of herbivores—important ones (in consideration of their number) are spotted deer, wildbore, Bison, Sambar, Barking deer, etc. Though the number of spotted deer seems to have somewhat declined (based on visual observation) there are still enough to sustain carnivores. In the track census of 1986 total of 1030 were sighted. Within this area are also found Leopards and Wild dogs. The number of Wild dogs fluctuates. It had gone up to 22 in 1979. But now they are 7 in number.

4. The Betla forest is rigidly protected and definitely provides safety to Wildlife to a greater measure on account of being a part of Palamau Tiger Reserve.

5. One drag factor, if it is taken as such, is the visits by about 20,000 Tourists annually in this area.

Arival of Begam in Betla

1. From the above it would appear that the forests of Betla, even with one drag factor of number of tourists, are conducive place for tiger. Consequently, this area has always been under occupation of a tiger in varying in number. However, the area remained vacant since the death of the only Tigress in March 1977 till the present tigress known as Begam came to stay by mid 1981. (It may be mentioned the Tigress that died in March 1977 never produced any litter even though she was seen mating twice. Was she sterile or did she kill and eat the cubs are not exactly known).

2. Begam was born in the last quarter of 1979 in Saidup compartment 3—about 15 km. away from her present home. On attaining her adulthood, she shifted to Betla forests which was vacant since the death of a previous Tigress in March 1977. Begam delivered her first litter in September 1983--having four cubs. One of the cubs died on 31st May, 1985. After a few months of the death of the cub, Begam was found visiting areas 6 km. beyond her usual home—range along with the cubs. After two/three such visits, Bobby setteled there alone since September/October 1985.

Description new home of Bobby

1. The new home of Bobby lies along the river Auranga, starting from the confluence of rivers Koel and Auranga about 8 km. up the river Auranga. The frequented areas lie on either of the river Auranga extending over about 32 sq. km. The river flows almost through the middle of the Bobby's beat.

2. The habitat of Bobby is formed mainly of Lantana, Karaonda (particularly on either of the river Auranga with tree species like Dhawtha, Salai, Khair very sparsely covering the hills falling within the Bobby's beat. The density of tree species is very very low. In fact, from a vantage point one can see major part of the Bobby's beat. The terrain is ravineous.

3. Though the river Auranga does not flow in summer, it sustains many water points althrough it.

4. There is, however, no herbivores to meet the requirement of Bobby's food except very few wild deer. But the entire home range of Bobby is the grazing ground of hundreds of cattle, that include cow, buffalo, bullock etc.

5. The area is not protected at all for Wildlife. In fact, hardly any resemblance of protection exists even though the territory falls within the jurisdiction of Forest Department.

Life style of Bobby

1. A comparison of these two habitats—one where she was born and the other which she had made her home, manifests glaring deficiency that may jeopardise the life of Bobby. That is the source of her food that consists of cattle only. Till now (June 1986) however, Bobby is surviving in the manner discussed below :—

2. Bobby has selected a cave on the top of Bhalahi pahar. From this point, she can scan very wide area of her home range. This enables her to locate the village cattle coming within her home range for grazing. Nearby there is a water pool containing enough water to meet her requirements. She comes out of the cave, selects a vantage point in consideration of the presence of cattle and kills. The kill is made at all hours of day. Sometimes, she succeeds in eating but often not, because of the hue and cry made by the cow boys. In one instance Bobby came like a flash, (as per statement of herd man who was hardly 5 to 6 m away from the cattle) and made a kill of one of the cattle. The man started thrashing the bushes with Lathi he was having and shouted. Bobby could not eat the kill and had to sneak away in the Lantana bush. She is also reported to start growbing at the sight of cow boy. She has not so far faced such disturbances in her small life span.

3. In spite of all these disturbances, Bobby is killing cattle at the rate of 10 to 15 per month. Such large number of kills of cattle, has generated great resentment amongst the villagers and they emphatically say that on account of Bobby their economy is adversly affected. One of the losers of the cattle stated that he had recently purchased a pair bullocks and one of them has been killed by Bobby and thus the other has become useless. The payment of compensation by Government is neither quick nor adequate. Under the situation his cultivation is sure to suffer. Doubtless Bobby has exposed herself to a great danger that may cause her death, but of which she is oblivious. How far she will get protection against these dangers is any body's guess. The Government authorities still seem to be at the thinking stage and endangered Bobby has not attracted their attention to the extent the situation demands. Will they wake up when she becomes a Man Eater ? No doubt, she is already a cattle lifter.

Problems

1. Two main points that emerge from this study call for immediate attention. Firstly whether Bobby be allowed to continue to stay in the inhospitable areas or efforts be made to take her out. Secondly, further study is needed to find out as to why has Bobby taken to killing cattle in such large number at such a young age particularly when she was born in a place of plentiful herbivores ? Has the mother been instrumental in this behaviour of Bobby ?

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Game Viewing Towers

By

Ashok Singh* and R.N. Pandey**

General

A game viewing tower is an aid to facilitate an observer to watch, study or photograph wild animals in their natural surroundings. While providing maximum possible security and safety to the observer, these structures do not cause any disturbance to the animals observed. Such watch towers, thus, are useful tools which can be used for environmental and wildlife education by interpreters. The are locally called '*Machans*'.

Site Selection

The game viewing towers may be of various designs, using different construction and fabrication materials, but before constructing any tower of any design, the factor of site selection is of prime importance. The different considerations in selecting a suitable site for erection of a watch tower are given below:—

(i) The area should be frequently visited by animals to be observed or studied.

(ii) There should be some qualifier to the habitat, e.g. palatable grasses, trees which attract birds or/and animals, water holes etc.

(iii) It should provide a commanding view. As far as possible, sites with a limited view should be avoided.

(iv) Besides the wildlife, the site should preferably provide good landscape too to reduce boredom.

(v) If it is proposed to be constructed near nala, river or lake, it should be opposite to the bank which is frequented by wildlife, but due considerations should be given to the light conditions particularly for photography.

(vi) As far as possible it should be at a distance from common traffic.

(vii) Perennial water sources provide better chances of game viewing than the seasonal ones.

(viii) As far as possible a site with natural camouflage should be selected.

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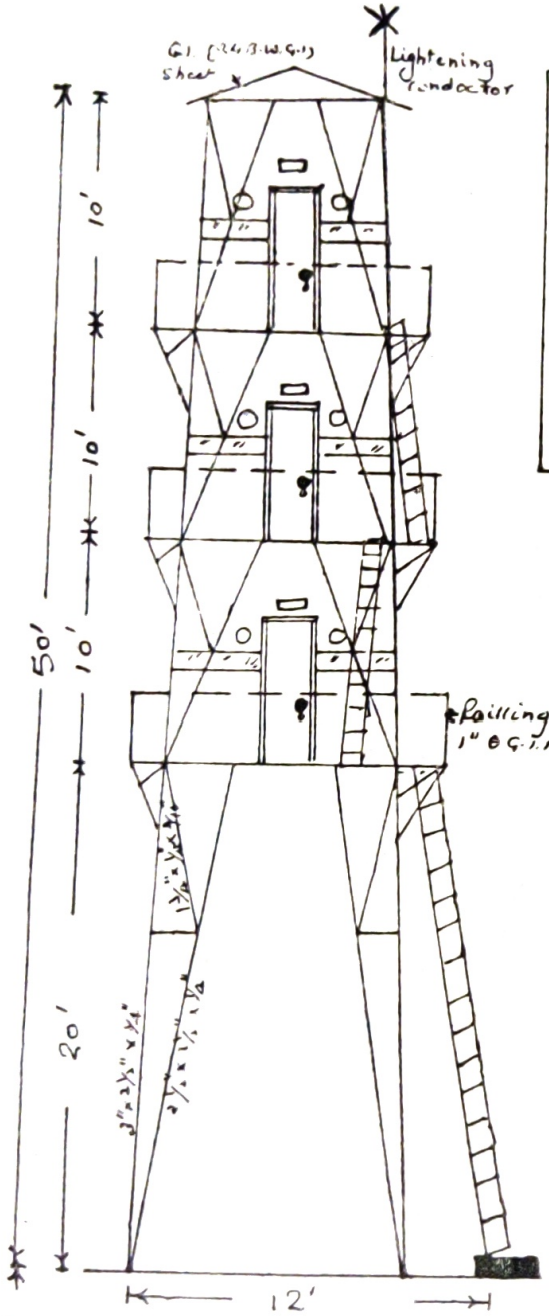
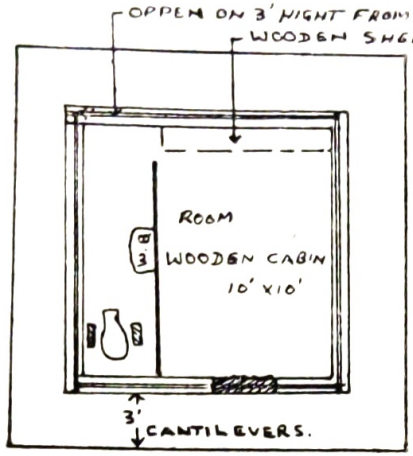
**Dy. Director, Project Tiger, U.P. Ramnagar.

MILD STEEL WATCH TOWER

MILD STEEL WATCHTOWER



ELEVATION

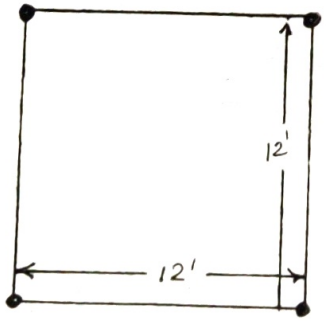


SIZE OF ROOM.

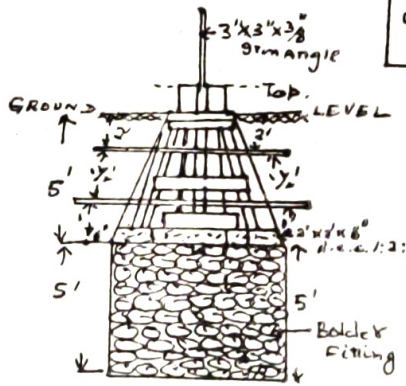
1- First Floor — 10'x10'

2. Second Floor - 8½'x8½'

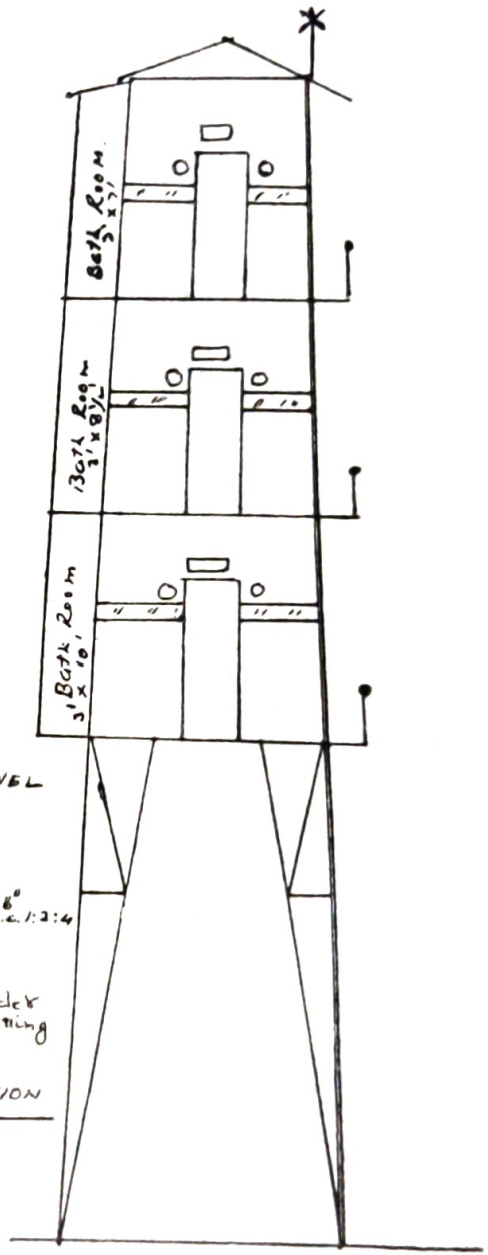
3. Third Floor - 7'x7'



PORTION OF R.C.C. FOUNDATION.



DETAIL OF FOUNDATION



FRONT SIDE ELEVATION

Important Considerations during Construction

Precautions to be taken at the time of construction may be enumerated as follows:—

1. Watch tower should be strong enough to bear the load to its full capacity safely.
2. It should not shake while people are climbing.
3. There should not be any hollow in the tree, trunk or branch if the tower is being constructed on a tree because there are chances of snakes etc. or other dangerous wildlife hiding in it.
4. In elephant country the minimum height from ground level should be beyond the approach of elephants. A minimum height of 20 ft. is recommended.
5. Proper camouflage should be provided by covering the tower naturally or artificially to merge with surrounds.
6. Use of foamy material, jute or coir matting on the floor is advisable to reduce noise while moving or changing the posture.

Types of Watch Towers

Game viewing towers may be of different types depending on the availability and choice of construction material, objectives and nature of its use. A few important types are as under:

i. Steel tower
ii. Masonry tower.
iii. Wooden tower.
iv. Platform or cabin on trees.

i. Steel Towers

Steel towers are expensive to fabricate and erect but have a long life, and maintenance cost is comparatively quite low. The advantages of a steel tower are:—

a—Having a long life these are quite suitable for regular use in Parks and sanctuaries.

b—There can be several storeys and observer can have the vantage point of his choice.

c—Provides more space to accommodate large number of observers at one time.

d—It provides highest degree of safety.

e—Parts can be replaced when required without dismantling the whole structure.

f - There is hardly any chance of its getting damaged by fire.

g—It can be dismantled and shifted to other sites if required.

h—Its maintenance cost is low.

Disadvantages

The disadvantages are:—

a—It is expensive to fabricate and erect.

b—Needs regular painting to prevent rusting and corrosion.

c—The effect of extremes of temperature is well marked.

d—Does not absorb sound and if anything e.g. a twig or branch or people etc. strike it the noise may disturb the animal.

e—Only the skilled labour can fabricate, erect or dismantle it.

Design

A 3-storeyed steel watch tower already being used in Corbett National Park is giving very satisfactory result and the plan of the same is being given.

ii Masonry Watch Tower

This could be made either of R.C.C. bricks or stone masonry. It may or may not be plastered or pointed.

Advantages

a—Its construction cost is low as compared with that of steel tower.

b—It has a fairly long life.

c – Can be constructed by locally available masons.

d—Chances of getting damaged by fire are low.

e—Quite safe for the observer.

f—It is very sturdy.

g—It can be so designed that it merges with the surroundings.

Disadvantages

a—Dismantling and relocation is not possible.

b—Effect of weathering becomes evident after sometime.

c—Large animals like elephants may cause some damage.

d—It is not very comfortable during hot months.

Design

Depending on the building material a masonry watch tower may be of:—

(a) R.C.C.

(b) Re-inforced-brick cement.

(d) Brick in cement mortar.

(e) Stone in cement mortar.

(f) Stone in mud mortar.

(g) A combination of two or more of the above.

While considering the architecture and design of the watch tower it is of utmost importance to bear in mind that the structure should be such that it merges with its surrounds.

iii. Wooden Towers

These may be purely of timber or bamboo or both and may be a combination of these with masonry.

Advantages

a—Low erection cost.

b—Appears to belong to the surroundings.

c—Comfortable in all seasons.

d—Absorbs sound.

e—It is possible to dismantle and re-erect at a different site.

f—Parts could be replaced when required.

Disadvantages

a - Susceptible to fire damage.

b - Needs regular maintenance and if not maintained properly, it may appear shabby and unsafe.

Design

These are totally wooden structures and depending on the availability and utilisation pattern, round timber, sawn timber and bamboo sticks are used for construction.

iv. Platform or Cabin or Tree

Such types are very easy to construct if a suitable tree is available at the site selected.

Advantages

a—Construction cost is very low.

b—Can be constructed in short time.

c—The quantity of construction material required is very small.

d—Merges with the surroundings very well. If properly camouflaged it is not conspicuous and therefore, wildlife is least disturbed.

Disadvantages

a—Uncomfortable during summers and windy days.

b—Tends to be shaky with the slightest wind.

c—Prone to damage by fire.

d—Limits the choice of site.

Design or Construction

These watch towers are constructed on branches of a single tree or by combing two or more trees and their branches depending upon requirement and suitability. There may or may not be the provision for stairs attached to the cabin. Putting some iron nails on tree trunk may also serve the purpose. A photograph of the same is being given to give an idea of this type of watch tower. Method of construction is very simple and can be designed by any local carpenter.

Precautions to be taken by observer

1. Silence is the most important thumb rule for observing wildlife.
2. One should have adequate supply of drinking of water and some chewing material as per his own requirements.
3. He should go prepared for staying in the watch tower for sufficient length of time, i.e. one should be patient on the tower.
4. No musical instrument or transistor etc. should be carried. However, tape-recorder for recording animal/bird sounds may be taken.
5. One on one tower system is better than the two or more because the possibility of talking can not be ruled out.
6. One should not be excited while observing the animals.
7. Spot light should not be used during dark hours. Moonlit night is always better and image intensifier can be used.
8. Left over food stuff should be properly disposed off so that wildlife do not have access to it. Feeding them may do more harm than good.

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Cattle Killing By Tigers And Leapords In Tiger Reserve, Palamau—An Analysis

By

Lal Ratnakar Singh, I.F.S. (P), Tiger Project, Palamau

1. Introduction

Palamau Tiger Reserve, being one of the 9 reserves selected initially for Project Tiger, harbours a rich fauna and flora and provides a suitable habitat for tigers and leopards. These large carnivores constituting apex of the food chain have been found engaged in domestic cattle killing which has increased significantly in the last few years, taking a heavy toll of domestic cattle and increasing the burden of compensation on forest department.

2. Abstract

Present observations deal with the increasing trend of cattle killing behaviour shown by Tiger and Leopard in this reserve. Statistics on cattle killings due to Tigers and Leopards in the last 10 years were analysed to form an idea about the adverse and disturbing behavioural traits of these magnificent cats.

3. Cattle killing incidences

Palamau Tiger Reserve is a village infested reserve having 90 villages within the area of reserve. In these villages, domestic cattle population includes more than 30,000 cattle hèads Though cattle killing by Tigers and leopards is not a new phenomenon for this region, yet incidence was not much up to 1980. After that there has been a sudden increase with a tendency to increase in number year after year.

Table 1

Year	Cattle Killed by Tiger	Leopard	Total
1975-76	45	—	—
1976-77	94	—	—
1977-78	101	20	121
1979-80	—	—	85
1980-81	103	164	267
1981-82	178	158	336
1982-83	145	151	296
1983-84	—	—	329
1984-85	—	—	337

Table 2

(Domestic cattle killed by tiger and leopard in 1985)

Rangs	Month	Buffalow T	Buffalow L	Cow T	Cow L	Ox T	Ox L	Cow Calf T	Cow Calf L	Buffalo Calf T	Buffalo Calf L	Horse & Mare T	Horse & Mare L	Goat T	Goat L	Total
Betla	Jan.-Mar.	2	0	3	5	5	2	1	1	5	1	0	0	0	2	27
	Apr.-Jun.	7	0	4	1	4	2	4	6	1	0	0	0	0	0	29
	Jul.-Sep.	2	0	9	4	3	0	6	11	3	1	0	0	0	0	39
	Oct.-Dec.	7	0	14	0	9	0	7	6	2	2	0	0	0	2	49
Chipa-	Jan.-Mar.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Adohar	Apr.-Jun.	0	0	0	0	1	0	0	1	1	0	0	0	0	0	3
	Jul.-Sep.	1	0	2	2	4	2	1	3	0	0	0	0	0	2	17
	Oct.-Dec.	0	0	0	0	0	2	0	0	0	0	0	1	0	1	4
Garu	Jan.-Mar.	0	0	0	8	4	12	0	11	1	0	0	1	0	5	42
	Apr.-Jun.	1	0	2	7	6	7	4	11	1	0	0	0	0	1	40
	Jul.-Sept.	0	0	1	3	3	6	0	5	0	0	0	1	0	2	21
	Oct.-Dec.	1	0	0	4	1	3	0	2	2	0	0	0	0	3	16
	Jan.-Mar.	1	0	1	1	4	1	3	0	2	0	1	0	1	3	18
	Apr.-Jun.	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5
	Jul.-Sept.	3	0	0	1	1	1	1	1	0	1	0	0	0	3	12
	Oct.-Dec.	1	0	3	1	1	3	0	3	1	0	0	0	0	0	13
Total		26	0	39	39	48	42	27	61	19	5	1	3	1	24	335

Leopard used to be the main killer of domestic cattle but in recent years killing by tigers increased considerably.

4. Analysis of killings in 1985

Palamau Tiger Project consist of 4 Ranges namely, Betla, Chhip Adohar, Garu and Baresand no. 2 exhibits the killings of different domesticated animals trimonthly in different ranges.

In case of killing domestic cattles, tigers and leopards follow their wild hunting behavioural preferences i.e. tiger goes for bigger cattle while leopard prefers smaller ones as is quite evident from the data. In the whole year 1985 not a single buffallo was killed by

leopard, even leopard did not show much taste for buffalo calves. Similarly just a single goat was killed by a tiger. Both Tiger and Leopard preferred to kill cows, oxen, and cow calves.

Interestingly enough, both tigers and leopards stick to an area for two to three days and kill similar type of cattle. It was observed many times that a tiger killed consecutively 2 or 3 cows or 2 or 3 buffalows before moving to another area and changing the prey cattle. Same was true in case of leopards.

5. **Change from wild hunting to cattle killings**

Observations and analysis reveal following factors responsible for this change in behavioural pattern. i) Decreasing no. of prey animals:- Census figures of the last few years exhsbit a very disturbing trend. While the number of tigers has increased from 22 in 1974 to 62 in 1984; the main prey population of tigers did not increase in the same ratio What is more alarming is the significant decrease in the main prey population after 1982.

Year	*Wild Boar*	*Rh. Monkey*	*Langur*	*Barking Deer*	*Sambhar*	*Cheetal*
1982	1500	3000	2000	300	500	2500
1983	1700	2500	1800	300	500	1900
1984	1300	2500	2200	400	600	2000
1985	1000	2200	2300	300	500	1700

Most of the tigers engaged in cattle killing do not return to the kill to eat the left portion of the corpse because corpse is either removed by the villagers from the place of killing (some tribes eat the left over) or buried by Forest department people. This is done to protect the tigers against poisoning by villagers (2 Tigers have been killed in recent past by poisoning.) But this has induced a behaviour of not returning to the kill in tigers. This unconsumed portion of the kill is compensated in the form of fresh kills by Tigers and Leopards. This has led to the increase in cattle killings in the past.

iii) Saturation of areas by Tiger:-

In the last 10 years population of tigers has increased about three fold. From 22 in 1974, it was 62 in 1984 census. In such a habitat as in Palamau tiger reserve, this population (6.68/100 km.) can be regarded as the level of almost saturation. Recent decrease in prey population without any epidemic breakout or untoward incidence implies that increase in tiger population above their optimum number (Table 3) which has forced them to spill over adjoining areas and to feed on domestic cattle. One remarkable thing is the decrease in Leopard population with the decrease in prey animals in 1980. It has almost become half during the last 5 years while their cattle killing incidences remain almost same exhibiting their more and more dependence for food on cattle?.

Table 3

Year	Tiger Population				Leopard Population (Total)
			Cubs	Total	
1974	8	10	4	22	—
1975	8	11	7	26	—
1976	11	14	5	30	65
1977	11	15	6	32	60
1978	11	15	6	32	60
1979	12	20	5	37	55
1980	—	—	—	47	55
1981	—	—	—	—	68
1982	15	28	6	49	34
1983	17	31	7	55	13
1984	19	32	11	62	29

iv) Large number of cattle in adjoining villages:—

It, particularly, facilitates tigresses in procuring food for cubs in the form of cattle kill. Mobility of a tigress is greatly reduced when it moves with young cubs. In this period it prefers to go for easy prey like domestic cattle which are easily available. For example, in Betla range of the reserve a tigress was noticed with a male cub in the early part of the year 1985. In this year, this tigress kept on preying upon domestic cattle to feed the cub and contributed much to the total cattle killing of Betla range by tigers alone which was 98 (Table 2).

v) Legacy of the behaviour born out of experiences of parents:—

The cubs, which are fed on cattle kills procured by their mothers, are subsequently trained for killing the cattle. Later on this behaviour persists. As these cubs on attaining maturity do not find themselves fully trained in hunting more active and alert wild animals, they continue to prey upon domestic cattle.

A male cub, which was noticed in Betla in early 85 and was fed by its mother on domestic cattle only, has been found to become an efficient cattle killer. Reportedly it killed a cow on 8 Sept. 85, an ox on 18 Oct., two oxen on 23 November, one ox on 23rd Nov. again

and one buffalo on 29th Nov. This exhibits how the behaviour of cattle killing is carried from one generation to another.

Conclusion

Considering the changes in the natural behaviour of few tigers which eschew hunting wild animals and takes recourse to cattle killing, some of the solutions that may lessen the problem could be increasing the area of the reserve, shifting of villages away from the reserve and convincing villagers to reduce the number of cattle because their number in excess not only provides easy aecess to tigers but competes, to some extent for food with the wild ungulates.

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World Charter for Nature

"I have said a hundred times and I do not mind repeating it a thousand times that a child in high school that has understood the principles of compound interest must understand that exponential growth in finite space must lead to catastrophy. The realisation of the danger fortunately grows in an exponential curve and the only question is whether the two curves will intersect before the point of no return is reached. That point may be very very near".

Such doomsday theories are not new. But, when this comes from the world's most eminent ethologist, Konard Lorenz, we would do well to listen. He explains the reasons for this situation thus:

"For too much of civilized mankind today is alienated from nature. Most people seldom encounter anything but lifeless, man-made things in their daily lives and have lost the capacity to under stand living things or to interest with them. That loss helps to explain why mankind as a whole exhibits such vandalism towards the living world of nature that surrounds us and makes our way of life possible. It is an important and worthy undertaking to try to restore the lost contact between human beings and the other living organisms of our planet. In the final analysis, the success or failure of such a venture will determine whether or not mankind destroys itself along with all the other living beings on earth."

If Lorenz is to be believed, the clock of life on earth is set at ten minutes to midnight and we cannot possibly dare to delay action any more.

Fortunately for humanity, the cry has been picked up by others who care; what is more, enlightened publicmen and world statesmen have rallied to the cause. Amongst these, India's late Prime Minister Indira Gandhi was throughout forthright and consistent. Addressing the Plenary Session of the U.N. Conference on Human Environment as Stockholm on 14th June, 1972, she stated:

"I have had the good fortune of growing up with a sense of kinship with nature in all its manifestations. Birds, plants, stones were companions and, sleeping under the star-strewn sky, I became familiar with the names and movements of the constellations. But my deep interest in this our 'only earth' was not for itself but as a fit home for man."

"It has been my experience that people who are at cross purposes with nature are cynical about mankind and ill-at-ease with themselves. Modern man must re-establish an unbroken link with nature and with life. He must again learn to invoke the energy of growing things and to recognize, as did the ancients in India centuries ago, that one can take from the Earth and thy atmosphere only so mnch as one puts back into them."

Eight year later, at the launch of the World Conservation Strategy in India on 6th March, 1980, she said:

"In his arrogance with his own increasing knowledge and ability, man has ignored his dependence on the earth and has lost his communion with it. He no longer puts his ear to the ground so that the earth can whisper its secrets to him. He has cut his links from the elements and has weakened resources which are the heritage of million of years of evolution – all those living or inanimate things, which sustain his inner energy—earth, water, air, the flora and fauna. This loosening of his intuitive response to nature has created a feeling of alienation in him and is destructive of his patrimony. So, while we have to think of conservation, we must ask whether man himself is growing into a being worth saving."

She also gave a call "for a systematic campaign to educate governments, political parties, students from pre-school age onwards and others, regarding the importance and relevance of conservation and the factors involved."

The phillosophy that all human conduct affecting nature must be carefully guided and judged has gained considerable ground in the last one decade, ultimately finding expression in what is called the WORLD CHARTER FOR NATURE, adopted and proclaimed by the General Assembly of the United Nations on October 29, 1982.

Modelled on the UN Declaration of Human Rights and inspired largely by the philosophy and principles of the Stockholm Declaration (1972) and the World Conservation Strategy (1980), the World Charter for Nature is really a collective call to humankind in favour of nature conservation and all that it stands for. Its main significance lies in the fact that for the first time the highest international forum for the consideration of human affairs not only found the time to debate the issue at length but also developed a consensus on fundamentals acceptable to the nations of the world.

The adoption of the World Charter for Nature by the UN General Assembly on October 1982 was the culmination of a seven year effort, starting from the opening session of the 12th General Assembly of the IUCN (International Union for Conservation of Nature and Nature Resources) at Kinshasa (Zaire) in September 1975. Speaking on the occasion, General Mobutu Seso Seko, President of Zaire gave a stirring call in the following words:

"The seas, the oceans, the upper atmosphere belong to the human community...One cannot freely overuse (such) international resources. People of goodwill...are looking to you for positive results...This is why, if I had any advice for you, I would suggest the establishment of a Charter of Nature...In so far as Zaire is concerned, we are ready to help you succeed...if we were asked to be a pilgrim for environmental protection, this we would be willing to be."

This set the ball rolling. The International Union for the Conservation of Nature and Natural Resources (IUCN) took up the challenge and soon appointed a task force consisting of some members of its Commission on Environmental Law, Policy and Administration (CEPLA) to produce something concrete. It is noteworthy that the six-member task force headed by Dr. Wolfgang E. Burhenne, Chairman, CEPLA, included India's eminent jurist, Dr. Nagendra Singh, Judge of the International Court of Justice since 1972.

Taking the UN Declaration of Human Rights as a model, the Task Force produced a draft charter which was considered at the next IUCN General Assembly held at Ashakabad (USSR) in September, 1978. Following discussions at the meeting, a draft was circulated to the IUCN members for comments and then a final draft was presented to President Mobutu of Zaire, on behalf of the IUCN, in November 1979. In June 1980, the Permanent Representative of Zaire to the United Nations transmitted the Draft World Charter for Nature to the UN Secretary-General, with a request that it be included on the agenda of the next session of the General Assembly.

In October 1980, the General Assembly adopted a resolution inviting member States to send their views on the draft charter to the Secretary-General and requesting the latter, in turn, to transmit these views to the next session of the General Assembly alongwith appropriate recommendations formulated in co-operation with the IUCN and the United Nations Environment Programme (UNEP). In accordance with this resolution, UNEP convened an ad-hoc expert group to examine the comments received from the various states. The group which again included an Indian, Mr. B.B. Vohra—met in Nairobi in August 1981 and prepared a revised draft of the charter, after considering the various comments received from about 50 states.

The exercise continued throughout the rest of 1981 and early part of 1982. Meanwhile, the African States adopted resolutions through the OAU and the Conference of the African Heads of States, expressing strong support for the draft charter. Finally, in September 1982, the UN Secretary-General recommended favourable consideration of the world Charter for Nature by the UN General Assembly.

Thus the stage set for the historic debate on 28-29 October, 1982, on the resolution by which the General Assembly "solemly invited Member States, in the exercise of their permanent sovereight over their natural resources, to conduct their activities in recognition of the importance of protecting natural systems, maintaining the balance and eguality of nature and conserving natural resources in the interest of present and future generat.ons. The resolution was carried by a vote of 111 to 1, with the United States exercising the sole dissenting vote. Earlier U.S. had urgea post-ponement of the vote for a few days to work out "a consensus text", but this move was resisted by the sponsors of the resolution led by

Zaire. Thus, on 29 October, 1982, the U.N. General Assembly adopted and proclaimed the World Charter for Nature.

The Charter * proclaims twenty-four basic principles of conservation and is divided into four main parts—(a) Preamble; (b) General Principles; (c) Implementation; and (d) Functions.

The Principles enunciated by the Charter for Nature are certainly high-sounding and may even appear utopian to realise. Besides, there is no doubt that the charter is strictly not a legal documment binding on every nation of the world. At best, it is what the jurists would call a new "soft law" instrument, having a normative character from its adoption by the U.N. General Assembly. If effectiveness would ultimately depend on the influence it brings to bear on the laws and practices of the numerous sovereignities of the world, in whose hands rests finally the destiny of humanity and the other living as well as non-living elements of the earth. For the present, one should draw statisfaction from the fact that at least a beginning has been made in the right direction; a new ray of hope promises to brighten the future of humankind. The leaders of the world have done well to come together for a cause as worthy as this. Only time will show whether such wisdom will prevail for all time in a spirit of humility best expressed in the following words of Alexander Pope:

* "From Nature's chain whatever link you strike.
enth or ten thousandth, breaks the chain alike.
And if each system in gradation roll,
Alike essential to th' amazing whole;
The least confusion but in one, not all
The system only, but the whole must fall."

THE WORLD CHARTER FOR NATURE

(*Adopted by the General Assembly of the United Nations on October 29, 1982*)

The General Assembly.

Reaffirming the fundamental purposes of the United Nations, in particular the maintenance of international peace and security, the development of friendly relations among nations and the achievement of international co-operation in solving international problems of an economic, social, cultural, technical, intellectual or humanitarian character.

Aware that:

(a) Mankind is a part of nature and life depends on the uninterrupted functioning of natural systems which ensure the supply of energy and nutrients,

(b) Civilization is rooted in nature, which has shaped human culture and influenced all artistic and scientific achievement, and living in harmony with nature gives man the best opportunities for the development of his creativity, and for rest and recreation,

Convinced that:

(a) Every form of life is unique, warranting respect regardless of its worth to man, and, to accord other organisms such recognition, man must be guided by a moral code of action,

(b) Man can alter nature and exhaust natural resources by his action or its consequences and, therefore, must fully recognize the urgency of maintaining the stability and quality of nature and of conserving natural resources.

Persuaded that:

(a) Lasting benefits from nature depend upon the maintenance of essential ecological processes and life support systems, and upon the diversity of life forms, which are jeopardized through excessive exploitation and habitat destruction by man.

(b) The degradation of natural systems owing to excessive consumption and misuse of natural resources, as well as to failure to establish an apporpriate economic order among peoples and among States, leads to the breakdown of the economic, social and political framework of civilization.

(c) Competition for scarce resources creates conflicts, whereas the conservation of nature and natural resources contributes to justice and the maintenance of peace and cannot be achieved until mankind learns to live in peace and to forsake war and armaments.

Reaffirming that man must acquire the knowledge to maintain and enhance his ability to use natural resources in a manner which ensures the preservation of the species and ecosystems for the benefit of present and future generations,

Firmly convinced of the need for appropriate measures, at the national and international, individual and collective, and private and public levels, to protect nature and promote international co-operation in this field,

Adopts, to these ends, the present World Charter for Nature, which proclaims the following principles of conservation by which all human conduct affecting nature is to be guided and judged.

1. General Principles:

(1) Nature shall be respected and its essential processes shall not be impaired.

(2) The genetic viability on the earth shall not be compromised; the population levels of all life forms, wild and domesticated, must be at least sufficient for their survival, and to this end necessary habitats shall be safeguarded.

(3) All areas of the earth, both land and sea, shall be subject to these principles of conservation; special protection shall be given to unique areas, to representative samples of all the different types of ecosystems and to the habitats of rare or endangered species.

(4) Ecosystems and organisms, as well as the land, marine and atmospheric resources that are utilized by man, shall be managed to achieve and maintain optimum sustainable producti-

vity, but not in such a way as to endanger the integrity of those other ecosystems or species with which they coexist.

(5) Nature shall be secured against degradation caused by warfare or other hostile activities.

II. Functions:

(6) In the decision making process it shall be recognized that man's needs can be met only by ensuring the proper functioning of natural systems and by respecting the principles set forth in the present Charter.

(7) In the planning and implementation of social and economic development activities, due account shall be taken of the fact that the conservation of nature is an integral part of those activities.

(8) In formulating long-term plans for economic development, population growth and the improvement of standards of living, due account shall be takn of the long-term capacity of natural systems to ensure the subsistence and settlement of the populations concerned, recognizing that this capacity may be enhanced through science and technology.

(9) The allocation of areas of the earth to various uses shall be planned, and due account shall be taken of the physical constraints, the biological productivity and diversity and the natural beauty of the areas concerned.

(10) Natural resources shall not be wasted, but used with a restraint appropriated to the principles set forth in the present Charter, in accordance with the following rules.

(a) Living resources shall not be utilized in excess of their natural capacity for regeneration;

(b) The productivity of soils shall be maintained or enhanced through measures which safeguard their long-term fertility and the process of organic decomposition, and prevent erosion and all other forms of degradation;

(c) Resources, including water, which are not consumed as they are used shall be reused or recycled;

(d) Non-renewable resources which are consumed as they are used shall be exploited with restraint, taking into account their abundance, the rational possibilities of converting them for consumption, and the compatibility of their exploitation with the functioning of natural systems.

(11) Activities which might have an impact on nature shall be controlled, and the best available technologies that minimize significant risks to nature or other adverse effects shall be used; in particular;

(a) Activities which are likely to cause irreversible damage to nature shall be avoided;

(b) Activities which are likely to pose a significant risk to nature shall be preceded by an exhaustive examination; their proponents shall demonstrate that expected benefits outweigh potential damage to nature, and where potential adverse effects are not fully understood, the activities should not proceed;

(c) Activities which may disturb nature shall be preceded by assessment of their consequences, and environmental impact studies of development projects shall be conducted sufficiently in advance, and if they are to be undertaken, such activities shall be planned and carried out so as to minimize potential adverse effects;

(d) Agriculture, grazing, forestry and fisheries practices shall be adapted to the natural characteristics and constraints of given areas;

(e) Areas degraded by human activities shall be rehabilitated for purposes in accord with their natural potential and compatible with the well-being of affected populations.

(12) Discharge of pollutants into natural systems shall be avoided and:

(a) Where this is not feasible, such pollutants shall be treated at the source, using the best practicable means available;

(b) Special precautions shall be taken to prevent discharge to radioactive or toxic wastes.

(13) Measures intented to prevent, control or limit natural disasters, infestations and diseases shall be specifically directed to the causes of these scourges and shall avoid side-effects on nature.

III Implementation:

(14) The principles set forth in the present Charter shall be reflected in the law and practice of each State, as well as at the international level.

(15) Knowledge of nature shall be broadly disseminated by all possible means, particularly by ecological education as an integral part of general education.

(16) All planning shall include, among its essential elements, the formulation of strategies for the conservation of nature, the establishment of inventories of ecosystems and assessments of the effects on nature of proposed policies and activities; all of these elements shall be disclosed to the public by appropriate means in time to permit effective consultation and participation.

(17) Funds, programmes and administrative structures necessary to achieve the objective of the conservation of nature shall be provided.

(18) Constant efforts shall be made to increase knowledge of nature by scientific research and to disseminate such knowledge unimpeded by restrictions of any kind.

(19) The status of natural processes, ecosystems and species shall be closely monitered to enable early detection of degradation or threat, ensure timely intervention and facilitate the evaluation of conservation policies and methods.

(20) Military activities damaging to nature shall be avoided.

(21) States and, to the extent they are able, other public authorities, international organizations, individuals, groups and corporations shall:

(a) Co-operate in the task of conserving nature through common activities and other relevant actions, including information exchange and consultations;

(b) Establish standards for products and manufacturing processes that may have adverse effects on nature, as well as agreed methodologies for assessing these effects;

(c) Implement the applicable international legal provisions for the conservation of nature and the protection of the environment;

(d) Ensure that activities within their jurisdiction or control do not cause damage to the natural systems located within other States or in the areas beyond the limits of national jurisdiction;

(e) Safeguard and conserve nature in areas beyond national jurisdiction.

(22) Taking fully into account the sovereignty of State over their natural resources, each State shall give effect to the provisions of the present Charter through its competent organs and in co-operation with other States.

(23) All persons, in accordance with their national legislation, shall have the opportunity to participate, individually or with others, in the formulation of decisions of direct concern to their environment, and shall have access to means of redress when their environment has suffered damage or degradation.

(25) Each person has a duty to act in accordance with the provisions of the present Charter; acting individually, in association with others or through participation in the political process, each person shall strive to ensure that the objectives and requirements of the present Charter are met.

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The Elephant in U.P. (India) – The Change in Status in Two Decades

V.B. Singh

In the yearly 60s, there arose an unprecedented clamour for the reduction of elephant population in U.P. Newspaper reports alleged that the elephant population had grown out of all proportion, laying waste agricultural crops and causing human deaths. According to these reports there were 1200 to 1400 elephants in the State and Lansdowne Division (Garhwal District) alone accounted for more than 600 elephants. Under persistent public demand for the reduction of their number, Government had to yield and permits were issued in 1963 for the killing of elephants. As many as 27 elephants were killed and 12 were reported to have gone wounded. Conservationists, alarmed at this serious threat to the survival of this species represented strongly to Government and pleaded that such a decision about the ultimate fate of the species should be taken only on the basis of a census of their population.

We carried out methodical census in the years 1966 and 1967. The results of the census are summarised as under :—

Category	I Count	II Count	III Count	Total	Average	Percentage
1	2	3	4	5	6	7
Male	75	112	101	288	96	29
Female	165	171	150	486	162	49
Calves	69	76	74	219	73	22
Total	309	359	325	993	331	100

It was inferred that in round numbers the population of elephants was composed of 30% male, 50% females and 20% calves. After formulating confidence intervals for average elephant population, it was concluded that the population was not likely to be more than 400 in number.

The total normal habitat (area over which they ranged) of wild elephants in the State was worked out to be nearly 2,55,000 acres, spread over the tract lying between Yamuna in the west and Sharda river in the East.

1976 census— After a decade of the last census, another census was carried out to determine the population trend. Drastic changes were obseved both in the extent and quality of the elephant habitat. The same method which was followed for the 1966-67 census was adopted. The 1976 census was carried out subsequent to the filling of Ramganga reservoir and the results were as under :

Category	I Count	II Count	III Count	Total	Average	Percentage
1	2	3	4	5	6	7
Male	110	116	149	379	125	28
Female	221	215	219	655	218	49
Calves	86	77	111	274	91	20
Tuskers (lone)	8	11	11	30	10	3
Total	425	419	490	1334	444	100

It was inferred that the elephant population consisted of 28% male, 49% females, 20% calves and 3% lone tuskers. Calculation were done to estimate 95% confidence interval for numbers in each category. It was concluded that the population had risen to just over 500.

During the last 10 years, very drastic changes had taken place in the elephant habitat in the State. A total of nearly 1,65,000 acres were brought under mechanised plantations after clearing the natural vegetation. The total effect of this factor was:

(i) reduction in the habitat.

(ii) reduction in food potential in the existing habitat.

(iii) movement into areas so far not used as their range. These areas are not as rich in food supply and can provide subsistence for a short period only.

The two other very important factors affecting the elephants adversly, which cropped up during this decade were :

(i) Construction of Chilla—Rishikesh power channal in Lansdown Forest Division.

(ii) Filling of the Ramganga reservoir in and near the Corbett National Park.

1986 Census—The third census of elephants in the State was carried out in 1986, after an interval of another decade. The same method as was followed in the previous two censuses was adopted. The results of this census are given in some detail, as unlike the previous two, these have not been published earlier.

The entire elephant habitat in the State is covered by the following four wildlife regions:—

(i) Dehra Dun region—includes Dehra Dun East, Dehra Dun West and Shiwalik Forest Divisions.

(ii) Kotdwar region—Lansdowne, Kalagarh and Bijnor Forest Divisions.

(iii) C.N.P.—Corbett National Park.

(iv) Western region—Ramnagar, Haldwani and Terai East, West and Central Forest Divisions.

The results of the census are as under:—

Counting date	Dehea Dun region	Kotdwar region	C.N.P.	Western region	Total
1	2	3	4	5	6
I Count—20.4.86					
Male	34	107	32	31	204
Female	41	191	71	30	333
Calves	41	89	58	10	198
Lone Tuskers	—	13	—	—	13
Total	116	380	161	71	748

(Contd.)

1	2	3	4	5	6
II Count—30.4.86					
Male	32	75	34	31	172
Female	35	164	70	35	304
Calves	18	70	60	10	158
Lone Tuskers	—	10	—	—	10
Total	85	319	164	76	644
III Count—10.5.86					
Male	27	73	26	44	170
Female	37	171	67	61	336
Calves	27	64	47	20	158
Lone Tuskers	—	11	—	—	11
Total	91	319	140	125	675

The results of the 1986 census are summarised as under:—

Category	I Count	II Count	III Count	Total	Average	Percentage
1	2	3	4	5	6	7
Male	204	172	170	546	182	20
Female	333	304	336	973	324	47
Calves	198	158	158	514	171	25
Lone Tuskers	13	10	11	34	12	2
Total	748	644	675	2067	689	100

Calculated $X^2 = 3.76$, where as tabulated X^2 at 95% confidence level and 6 d.f. is 12.59. This proves the hypotheses that all the three counts represent the same population.

We may, therere, infofere that elephant population consists of 26% male, 47% female, "25% calves and 2% lone tuskers.

In order to estimate 95% confidence interval for numbers in each category, the following celculations are done :—

Category	p_1	np_1	q_1	$n_1 q_1$	$\sqrt{np_1 q_1}$	$2\sqrt{np_1 q_1}$	95% Confidence interval
1	2	3	4	5	6	7	8
Male	.26	182	.74	135	11.5	23	159 to 205
Females	.47	324	.53	172	13.0	26	298 to 350
Calves	.25	171	.75	128	11.0	22	147 to 195
Tuskers (Lone)	.02	12	.98	12	3.5	7	5 to 19

On the basis of the evidence furnished by the data as given above the population of elephants in U.P. has risen to just over 750.

For those interested in having details of the population in the various specific areas, the results of the 20-4-86 count are given as under, as they approximate to the statistically calculated population of 750 numbers :

Forest Division	Male	Female	Calves	Lone	Total
1	2	3	4	5	6
LANSDOWNE	83	146	71	9	309
BIJNOR	8	22	9	4	43
KALAGURH	16	23	9	—	48
Total-Kotdwar region	107	191	89	13	380
CORBETT NATIONAL PARK	32	71	58	—	161

(Contd.)

1	2	3	5	6	7
HALDWANI	18	13	4	—	35
RAMNAGAR	3	5	1	—	9
TARAI WEST	1	—	—	—	1
TARAI CENTRAL	9	12	5	—	26
TARAI EAST	—	—	—	—	—
Total Western region	31	30	10	—	71
SIWALIK	22	9	6	—	37
DEHRADUN WEST	3	4	5	—	12
DEHRADUN EAST	9	29	30	—	67
Total Dehradun region	34	41	41	—	116

Discussion

(i) The three censuses indicate that the rate of growth in the period 1967-1976 was nearly 3% while that during the decade 1976-1986 was 5%. The population which stood at 400 in 1967 went up to 750 in 1986, that is, it almost doubled itself in 20 years.

(ii) The calving percentage in Lansdowne Division during the period 1967-76 was 4.2% while for the same area it was 4.8% during the 1976-86 period. It should be kept in mind that as many as 32 calves were trapped in this division during the period 1976 to 1986. This trapping has not affected adversely either the population growth or the percentage of calves in the population. This also confirms the fact that population control of elephants can not be effected by trapping young calves, as their removal induces breeding in the population. In fact the percentage of calves has risen from 20% of the population to 25%.

(iii) During the 10 years from 1976, as many as 54 elephants died. Six of them died due to intra-specific fights, 5 died of electrocution and 2 of accident against railway trains. The aest died of old age or due to other miscellaneous causes.

(iv) During the same period as many as 56 persons were killed by the elephants.

(v) It will be seen that nearly 70% of the elephant population is confined to two areas— Corbett National Park and Lansdowne Forest Division.

Protected areas in the elephant range

As mentioned earlier, the bulk of the elephant population is confined to two areas—Corbett National Park and Chilla area of Lansdowne Forest Division. The survival of the north western population of Indian elephant depends how well we are able to protect their habitat in this tract. Adverse factors like the Chilla power channel which has put a stop to the movement of elephants even upto the river Ganga and the human population on the right bank of Ganga creating similar conditions for the elephants in the Doon valley have worked as veritable threats to the survival of this species in the State. It is hoped that these difficulties will soon be removed after the creation of Rajaji National Park. This National Park will encompass a total area of 800 sq. kms. of the existing sanctuaries Rajaji, Motichur and Chilla but also 215 sq.kms. of adjoing forests which are essential to make it a viable ecological unit. Efforts are being made to provide a corridor, adequate in width and cover, to restore a part of the migration route. There is also a plan to construct two over-bridges on the Chilla power channel at two strategic points on the corridor on the right bank will help the elephants in their movement from the left bank forests to the right bank forests of the river Ganga. These steps will thus restore, to certain measures, the conditions which existed in the area some two decades back. The management of the Corbett National Park will soon have under their control the western adjoing area including the entire catchment of Sona nadi river, as another sanctuary. Thus, almost the entire elephant habitat between the Corbett Park and Shiwalik Division will come under the category of protected areas, where steps will be taken to conserve and augument the food supply for the elephants. These steps, it is confidently believed, will go a long way towards ensuring the survival of this species in the State.

Acknowledgements

The author wishes to express his gratitude to Sri G.K. Shukla, Chief Statistical Officer, U.P. Forest Department for carrying out statistical analysis of the census data.

Note:— This is the third paper dealing with the status of elephants in Uttar Pradesh. The first paper was published in the journal of Bombay Natural History Society 66 No. 2 and the second was published in Vol. 75, No. 1 of the same journal. The two papers dealt with the population, habitat status and the problems concerning the survival of elephants in U.P. as the position stood in 1966 and 1976, respectively. This paper gives a glipse of the census figures and the habitat status as it stand in the year 1986. Thus the three papers cover a period of two decades and give a picture of the increase in population and change in its structure and the related problems during the period.

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The Maneating Phenomena an Ecological Crisis

By

Arjun Singh

The Wildlife (Protection) Act 1972 in Section 1 Subsection 11 Clause 1. a defines the procedure of dealing with so called meneaters. "The Chief Wild Life Warden may, if he is satisfied that any wild animal specified in Schedule 1 has become dangerous to human life– by order in writing and stating the reasons therefore, permit any person to hunt such animal, or cause such an animal to be hunted.

Hunting is defined in the Act in Section 1 Subsec 2 Clause (16) (a). Capturing, killing, poisoning, snaring, and trapping of any wild animal.

The operative discretion lies solely with Chief Wild Life Warden and in spite of the qualifying safeguard of "Stating the reasons therefore", there is no doubt that he is the final autority, the Lord High Executioner, with the arbitrary power of life and death.

The framers of the Act doubtless did not envisage the recurrent phenomena of maneating caused by habitat degradation by human exploitation and encroachment, and the onus which devolves on a single bureaucrat, pressurized by political superiors, needs to be amended.

Maneating as described by Corbett, is the compulsive seeking of human flesh by carnivores, whatever the reason, and the Champawat and Panar maneaters killed 836 victims between them, and even then, judging by the period over which they operated, they did not subsist entirely on human prey.

The present situation would be ludicrous, if it were not tragic. All innocent tiger was arbitrarily trapped outside the Dudhwa National Park out of a family of four animals and sent to the Lucknow zoo to appease local public sentiment. Subsequently when the killings did cease then the real maneater was destroyed: A lone man was killed and allegedly eaten by a particular tiger in April 1982 in te Corbett National Park. Two years later another lone man was mauled in the same area. The tiger was trapped and sent to zoo, though a tigress and cub were also active, and it is suspected that she did the mauling: Four years ago a tiger was trapped and sent to the zoo for killing 3 lone men over a period of 3 years, in the buffer zone of the Corbett Park. where villagers had encroached into the Reserved Forest and established habitation and pathways in offorested buffer areas. Other tigers have also been trapped, presumably on such slender evidence and sent to zoos, where battered and bruised, and their canines broken in their efforts to escape, not one has survived for any length of time. It needs to be said that these hurried captures are initiated to please the

local political master, by the bureaucratic Pooh Bah who finds that it rests easier, on his guilty conscience to order a capture for though trapping is a legal ploy under the Act, it has come to typify an irreesponsible act whereby the animals life is "Saved". Though among other humiliations they are confined to constricted and unpleasant cages, with a portion of their substandard rations forfeit to the zoo staff. For a human a life sentence is equated with the final punishment, but for the animal this reprieve is a form of reincarnation.

Wild Life Conservation is motivated by a respect for other life forms, and the symbolic rallying cry of 'Save the Tiger' collected 1.8 million dollars almost overnight, mostly from school children. The stark reality stated that the population in India from forty thousand art the turn of the century had dwindled to one thousand eight hundred and twenty seven in 1972. Characteristically the Indian Prime Minister cleared the way for the immediate inauguration of Project Tiger, and the World Wild Life Fund gave a commitment of one million dollars towards its implementation.

How eleven years later after the euphoric launching of 'one of the worlds greatest conservation schemes' the Project has lost direction, sustained by the spurious claim that it is entirely an Indian Project. Fantastic increases in tiger populations have been claimed by resident Field Directors, who run their own local censuses, and have come to regard population increases as a status symbol. These biased figures are supplied to International Forums and unreservedly accepted as one of the most successful conservation schemes in the world. The Corbett National Park with supposed population of 44 tigers in 1972, and at saturation point according to a wildlife authority, has ten years later registered an increase of 15% per annum to a total of 112: Simlipal, another Project area had 65 tigers in 1979. According to its Field Director. According to a local Forest Officer there are no more than 8. Other project area are also similarly afflicted as these areas are treated as inviolate little empires. Privately Project Officials admit that the figures are highly questionable, but enmeshed in the bureaucratic numbers game they are compelled to record an annual increase, regardless of where such preposterous figures are leading. It might also be pertinent to note for comparison that the lion population in the Nairobi National Park remained stationery for over fifty years, and the Serengeti National Park registered a limited increase of 5.5% over a period of four years, and this did not take into account the natural elimination of aged animals. The population of territorial carnivres is largely self regulating.

The so called Maneating Phenomens' is claimed to be caused by spillovers from successfully breeding tigers into buffer areas, where they come into conflict with humans, but equally valid is the obverse facet that Forest habitat areas are being constricted due to human encroachment and overuse and with the unbridled population increases and poaching of wild prey species, tigers are increasingly accepting the human as a form of prey due to a process

of familiarisation. Previously due to an upright stance, and other alien practices, including their diurnal activities they were assiduously avoided. Once this acceptance takes place the problem of human-tiger conflict will be immeasureably increased, for it must be realised that to a predator all animate objects are regarded as prospective prey, whose acceptance is controlled by other factors. For the tiger, the elephant is to large a prey, the mouse is too small, the human is unfamiliar. But these are only inhibiting features.

An ominous statement was made by the Director, Project Tiger at the Meeting of the IUCNS Cat Specialist Group at Kanha, perhaps alarmed by the unfettered claims of his Project Officials.. In reply to my assertion that census figures in Project Areas were highly exaggerated, he said that figures did not really matter, and we should be more concerned with the state of the ecosystem, though he did not agree to my suggestion for an independent Committee of appraisal. Such a half-baked statement is unworthy of an Organisation which has run a Save the Tiger Project for eleven years, and had hitherto relied on wild and euphoric claims to be at their own image as conservationists. The health of an ecosystem is measured by the maximised balance of all facets, and to seek to depress the status of one of its components to even up the false claims they have made is to create an irresponsible situation.

Maneater are generally created by adverse human activities and their elimination should not be sought as an automatic solution to a socio-ecologicol problem. The devastating floods caused by the insensate over-exploitation of timber in our river catchment areas is an ecological crisis, but we not seek to dam the river, or divert its course if it has washed away whole villages and rendered millions destitute and homeless. We go in for vast afforestation schemes to prevent the further erosion of our mountain slopes. Yet though the killing of human by the tiger is a similar natural reaction against the enroachment and despoilation of habitat areas, and poaching of wild prey species, we seek, not to remedy the situation we have created, but the simpler and irresponsible solution of destruction because of the political vulnerability of the tiger, who has no vote, and no jurisprudence to support his claim to existence.

Forest Officials manning Project areas are Foresters by training, White Collar Administrators by inclination, and Wildlife Managers by appointment, and without exception they are headquartered over 30 miles away from the sphere of jurisdiction, in urban localities, and within easy reach of their political superiors. They have second hand acquaintance with Wildlife Managerial problems, and their knowledge of the tiger is largely governed by myths handed down by sport killers, and gleaned from the pursuit of this secretive animal which have invested it with a ferocity, which in reality is an aggressive reaction to remorseless hunting. Tigers were supposed to be potential maneaters whose lust for

human flesh merely awaited the advance of age or the handicap of a wound to convert them into ravening monsters in search of the easiest prey. This according to modern informed experience is a base canard, and the so called maneaters which have been destroyed have been mainly, in their prime. The old tigers fade into oblivion, their waning powers unable to subdue normal prey, and their mortal remains rest for a short while in the dense undergrowth of their habitat, untill buried in the leaf mould of the trees that sheltered them, they disappear into the forest from whence they came.

Wounds are also not an inveterate to cause of maneating, and as an instance a tiger was caught in a gin trap, and speared repeatedly in the rump. He died of starvation and septicaemia five weeks later by a pond in the centre of a large inhabited village. A young tiger with his lung pierced by a porcupine quill died in similar circumstances in a populated area without harming anyone. Invariably the basic cause of maneating is a combination of non-availability of regular prey species, and familiarisation with the human, though it may sometimes be triggered by incapacity and an prolonged period of suffering. For instance a tigress I shot had its jaw and canine broken by a bullet, but did not take to maneating till the jawbone had calloused over. Another tiger took to maneating many months after its lower canines and carnassial teeth had been fractured by a charge of buckshot. The tiger, whose preservation began as that of the apex for the conservation strategy of a varied and complex biotope, has now become a symbol of the underdog, typifying the natural reaction of the ecosystem against human excesses, but for which he should be punished for not obeying man made laws. When a carnivore is deprived of normal prey, he will eventually turn to what is available. When a massive hunger assails a tiger, fortified by a compulsive process of familiarization, he will turn to the human as a prey species. In the days before the World War the tiger accepted a buffer zone between his habitat, and that of human endeavour and remained isolated, and even the presence of good prey populations was not inducement enough for him to transgress this compulsively imposed barrier. But now the buffers ara down, and the tiger has perforce to try to co-exist with his oppressor. It is essential however to appreciate the fact that man can not share space with the tiger, for any length of time, for eventually a familiarity will evolve into the acceptance of man as a prey species. Therefore, a tiger's habitat must remain inviolate. Wild Life areas must be rationalised to exist in separate niches from the human population for once a compromise is accepted it is the beginning of a process of attrition for the microcosm of wildlife. The human must for ever remain an intruder into wildlife areas. Whether this is possible or otherwise with our uncontrollable population surge will depend whether the tiger is going to survive into the future.

The recent proposal of Project Tiger to have multiple use areas used both by tigers and men is a regressive measure, and it is astonishing that such a thought should be mooted after 11 years of experience. TIGER AND MAN CANNOT SHARE SPACE.

A rethinking is essential if the tiger is to be preserved for the future, for as I have said the Project appears to have lost direction. The Maneating tiger must not be treated as an aberrant who must be eliminated as soon as possible for infringing man made laws, but as a normal tiger who has been diverted into unnatural ways by human delinquency, and efforts to wean such an animal from the lapse into habits contrary to his normal mode of existence should be a matter of policy, and not of discretion which will vary with individuals.

An expert Immobilization Squad with proper equipment should initially tranquilize the tiger or leopard which has lapsed into unnatural ways. After an inspection as to the cause of the so called aberration, the animal should be considered for release into some suitable areas, or for a mercy killing if there is no chance of a recovery from the injury or ailment. In no case should incarceration in a zoo be considered for it is against the dignity of any arinate being confined for no fault of its own and there is no record of a captured free ranging tiger having survived in captivity for any length of time, as caged in ghetto, conditions their powers atrophy, until death in the form of a merciful release intervenes.

Unfortunately Forestry Officials persuaded by political pressures and incomplete knowledge maintain that 1. It is impossible to wean a tiger or leopard from maneating. 2. If such an animal is translocated it is merely a question of transferring the problem of maneating to another area. 4. A translocated animal, especially a male, might not be accepted by other conspecifics, and may be eliminated in a territorial conflict.

On reflection these are spurious objections advanced by closed minds used to academic arguments which relate to why a thing can not be done and not how it can.

1. A family of a tiger, tigress and 2 small cubs took to maneating because of the dependent cubs, indiscriminate poaching on the Nepal border, and a severe burning of stalking cover. They were tided over this period of stress by a selective baiting, and after the monsoons the cubs were well grown youngsters, aud there has been no case of maneating since.

2. The human is not a normal prey species, and is only accepted by the tiger under circumstances of grave compulsion, and uubearable pressures of starvation conditions. Once this compulsive familiarlty with humans is removed, and normal prey made available, the influence of a closed environment is so pervasive, that a hankering, after an unnatural diet, primarily due to necessity, will not persist. Therefore, the question of a translocation merely transferring the problem to another area does not arise, as a shifting to a suitable area will mean that the pressures which were prevalent in the original habitat will not obtain.

3. Conspecific competition is an accepted medium of population control among tigers and is a continual process in areas of optimum population. The chance of acceptance or

rejection of a translocated tiger by the local community is surely not the business of the human who sought to destroy him in his original habitat in any case. Better by far that the moral onus of life or death develve on the species, where the chance of an acceptance would increase the genetic diversity lacking in most of our tiger areas.

The unfortunate man-tiger conflict has to be resolved by the human, but it is not possible if the essential dignity and way of life of the animal is ignored. To his way of consideration the world was made for tigers. and if we are to preserve them in perpetuity, the microcosm wherin they exist must not be violated. Traffic rules are enforced in cities, and a car operator is not penalised for a defaulting pedestroian, yet there are no rules governing the entry of single persons into tiger areas. The two tigers caged in the Corbett National Park were punished for attacking lone men who had penetrated deep into habitat areas, and it is obvious that what is sauce for the goose is not sauce for the gander, epecially when the goose has the vote.

Finally the benefits of tourism must be considered for its positive virtues, and not as an unmitigated evil to be eliminated. Control is essential in all fields of human endeavour, and it is incorrect to brand tourism for its nuisance value. In any case when we are unable to control poachers and human scavengers from entering the forests, the disturbance value of tourists become academic. We should aim at the positive benefits of a controlled tourism. The tiger is the most distinguished of animals, and Wildlife is an International Subject, and we should not deny the tourist the chance of seeing a tiger, while extolling the beauties of the Taj Mahal.

The positive virtues of tourism should be utilised as we maintain an international window on our Project Areas, where we can learn of modern methods of Wildlife Management, and where local abuses are not perpetuated, because Big Brother is watching. The time is past when we could allow nature to recuperate on her own, for our processes of exploitation have gone to far. It takes a thousand years to build a centimetre of topsoil, and we wash six thousand Million tonnes into the sea each year due to our overexploitation of timber stands. Wild Life Management procedures must be a dynamic process when each facet of the ecosystem is vitalised to its maximum, for we have over reached the old niche of bounteeus Nature repairing the damage we have done. Else all we will listen to is the thunder of hooves as the Four Horsemen of the Apocalypse ride by.

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Status and Distribution of Mammals in Nanda Devi National Park

By

P.C. Tak*

Introduction

While working on a Man and Biosphere (MAB) research project entitled "Status survey of endangered and threatened mammals and birds at Nanda Devi National Park" the author had an opportunity to make some field observations on status and distribution of mammals of the park.

The park is a cup-shaped valley surrounded by lofty peaks in the heart of the Himalaya, the 800 km² park is geographically situated between 30°16′-30°32′ N Latitudes and 79°44′-80°02′ E longitudes. It covers an altitude varying from *ca* 2100 m to *ca* 7817 m.

The park area or the Rishi Gorge remains under a thick carpet of snow during winter and hence it is accessible only for a limited period of about five months, i.e., from June to October.

To reach the park from Delhi, one has to go via Rishikesh to Joshimath, Tapovan and Lata which is the last motor link for the park. Lata village is the last link with the outer world.

In fact the present communication is one of the several outcomes of the seven, 2-7 weeks, expeditions made to the park area from 1981 to 1985. During this period more than 700 observation-hours were spent in all the three major vegetation-types (Sub-alpine forest, Sub-alpine scrub and Alpine meadows) of the park. The altitudinal range explored varied from 2750 m to 4950 m.

In all, records of 14 species of mammals belonging to 13 genera, eight families and five orders were obtained from the park.

A detailed systematic account of their status and distribution is as follows:

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Status and distribution

CLASS : MAMMALIA
ORDER : PRIMATES
FAMILY : CERCOPITHECIDAE
GENUS : *PRESBYTIS* Escholtz, 1821.

1. *Presbytis entellus schistaceus* (Hodgson), Langus (Entellus Monkey.
Ellerman and Morrison-Scott. (1951). Checklist : 205.
Status : Common.
Distribution : Restricted to the Lower Rishi Gorge (The outer sanctuary). Often seen in birch forests and other patches of forest in the Park.

ORDER : CARNIVORA
FAMILY : URSIDAE
GENUS : SELENARCTOS Heude, 1901.

2. *Selenarctos thibetanus* (G. Cuvier), Asiatic Black Bear.
Ellerman and Morrison-Scott. (1951). Checklist : 239.
Status : Uncommon.
Distribution : Mostly found in the Lower Rishi Gorge. Leaves planty of foot prints in the soft ground.

GENUS : *URSUS* Linnaeus, 1758.

3. *Ursus arctos* Linnaeus, Brown Bear.
Ellerman and Morrison-Scott. (1951). Checklist : 236.
Status : Rare.
Dstribution : No authentic record of its existence in the Park is available at present.

EAMILY : MUSTELIDAE
GENUS : *MUSTELIA* Linnaeus, 1758.

4. *Mustela kathiah* Hodgson, Yellow-bellied weasel.
Ellerman and Morrison-Scott. (1951). Checklist : 259.
Status : Common.
Distribution : Everywhere in the Park. Often seen among boulders at 4000-4400 m.

FAMILY : FBLIDAE
GENUS : *PANTHERA* Oken, 1816.

5. *Panthera pardus* (Linnaeus), Leopard.
Ellerman and Morrison-Scott. (1951). Checklist : 316.
Status : Uncommon.

Distribution : Found in the Lower Rishi Gorge. Difficult to observe on account of its nocturnal and shy habits. Leaves plenty of foot prints in the river bed and soft ground.

6. *Panthera uncia* (Schreber), Ounce of Snow Leopard.
Ellerman and Morrison-Scott. (1951). Checklist : 320.
Status : Rare.

Distribution : Mostly found in the Upper Rishi Gorge (Inner sanctuaay). Very difficult to sight this highly endangered felid on account of its nocturnal and shy habits, and its limited populations and distribution. Often leaves plenty of foot prints in the soft ground and snow.

ORDER : ARTIODACTYLA
FAMILY : BOVIDAE
GENUS : *CAPRICORNIS* Ogilby, 1837.

7. *Capricornis sumatraensis* (Bechstein), Serow.
Ellerman and Morrison-Scott. (1951). Checklist : 399.
Status : Common.

Distribution : Confined to lower part of the Lower Rishi Gorge. It prefers thickly wooded gorges and can often be seen in the mornings and evenings when it comes out to graze on the range herbage of the more open slopes.

GENUS : *HEMITRAGUS* Hodgson, 1841.

8. *Hemitragus jemlahicus* (H. Smith), Himalayan Tahr.
Ellerman and Morrison-Scott. (1951). Checklist : 403.
Status : Uncommon.

Distribution : Mostly found above the tree line on the cliffs and ledges of Dharansi Col. and its adjoining ranges in the Park.

GENUS : *NAEMORHEDUS* H. Smith.

9. *Naemorphedns goral* (Hardwicke), Goral.
Ellerman and Morrison-Scott. (1951). Chekliss : 401.
Status : Uncommon.

Distribution : Found only on the outer slopes of the ridges, forming Park boundary, in the NW of the Park.

GENUS : *PSEUDOIS* Hodgson, 1846.

10. *Pseudois nayaur* (Hodgson), Bharal or Blue sheep.
Ellerman and Morrison-Scott. (1951). Checklist : 410.
Status : Very common.
Distribution : Throughout in the Upper Rishi Gorge (the Inner sanctuary area of the Park. Frequently seen on the alpine meadows in the mornings and evenings when they come out for grazing.

FAMILY : CERVIDAE
GENUS : *MOSCHUS* Linnaeus, 1758.

11. *Moschus moschiferus* Linnaeus, Musk Deer or Kastura.
Ellerman and Morrison-Scott. (1951). Checklist : 353.
Status : Common.
Distribution : Throughout the Park in the sub-alpine birch forest. Difficult to observe on account of its concealing habits. Leaves several "Latrine" sites (distinct groups of pallets).

ORDER : LAGOMORPHA
FAMILY : LEPORIDAE
GENUS : *OCHOTONA* Link, 1975.

12. *Ochotona roylei* (Ogilby), Royle's Pika.
Ellerman and Morrison-Scott. (1951). Checklist : 450.
Status : Very common.
Distribution : Throughout the Park. Frequently observed among boulders between 3500 m and 4450 m.

ORDER : RODENTIA
FAMILY : MURIDAE
GENUS : *ALTICOLA* Blanford, 1881.

13. *Alticola roylei* (Gray), Royle's High Mountain Vole.
Ellerman and Morrison-Scott. (1951). Checklist : 670.
Status : Uncommon.
Distribution : Occasionally seen, feeding on grasses, at Upper Deodi (3850 m) in the Park.

GENUS : *MUS* Linnaeus, 1758.

14. *Mus booduga* (Gray), Little Indian Field Mouse.
Ellerman and Morrison-Scott. (1951). Checklist : 609.
Status : Uncommon.
Distribution : Occasionally seen at Latakharak (3700 m) in the park.

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Pollination Mechanism in Orchids*

P.K. HAJRA

Dehra Dun (U.P.)

This 'vislent universe of ours' may at first glance seem terrifying but on close examination, underneath the superficial layer of savagery we find that all types of life on Earth would perish but for the interdependance between them. Animals depend on other animals, plants depend on plants and also animals depend on plants and vice versa.

The beautiful world of orchids would be non-existent but for the animal pollinators which help them to proliferate. It is ironical that while the very shapes and colours which has helped them to multiply has also brought them to their doom, as man has cast his greedy eyes upon them. However, on the positive side it is these same colours which are attracting for it an army of protectionist conservators to help to change this trend.

Charles Darwin (1877) poineered the study of the pollination mechanism in orchids. Orchid flowers have one or two stamens. In case of orchids with one stamen i.e. Monandrae, the pollen is not powdery as in most other angiesperms (except in a few terrestrial orchids), but are united into a small mass called pollinia, containing some thousands of pollen grains. A single another contains 2, 4, 6 or 8 of such masses. Though cross pollination is the rule in Orchidaceae, self pollination have also been reported in a number of cases specially in cleistogamous species. The pollinia is usually transferred from the anther of one flower to the stigma of another by the insects and the flowers are so formed that when the insects visit another flower the pollinia are automatically placed upon the stigma.

Resupination in the long lasting orchid flowers, i.e. the 180° turning of the flower is remarkable device by which cross pollination is secured. Insects searching for nectar are attracted by the exuberantly coloured, fantastically shaped orchids and settle down on the lip, where the pollinia sticking to their body are transferred, to another flower.

The variety of structures is almost endless involving adaptations for inducing a large number of insects to visit the flowers. The extreme specialisation of structures to ensure pollination by a particular insect is more developed in orchids than in any other family of plants.

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* Based on popular lecture delivered by the author on 29th September 1985 in the Seminar on plant and Animal Interaction, Puna.

Members of the Coleoptera, Hymenoptera, Diptera etc. are some of the common insect pollinators of orchids (Nilsson, 1978, 1979; Pijl, 1966). Most of the species of orchids are, as a rule, intimately specified to a certain pollinator species e.g. *Platanthera* to hawk-month, *Bulbophyllum* to different species of *Diptera*, *Habdnaria obtusata* to Mosquites etc.

Grant (1950) made an excellent attempt to describe the pollinators and their specificity. Loppick (1957, 1977) gave convincing evidence to subsantiate the concept of flower-pollinator co-evolution.

An orchid with an unusually long spurred flower was discovered in Madagascar and it was predicted that there would be a moth with an equally long curled up tubular tongue or proboscis and later, such a moth was discovered by Zoologists.

The structure, posture and colour of the whole orchid flower or the lip with the column is only for securing cross pollination by maximum attraction to specific insect visitors. Similarly, in case of orchids with two stamens i.e. diandrae the end of the column pointing forwards so that it is clearly seen at the base of the lip, is occupied by a curious structure called a staminode. On either side of the column behind the staminode are two functional stamons. Each anther contains two masses of sticky pollen which are easily removed like the pollinia of the Monandrae. Pollination is effected by the insects entering the pouch of the lip to look for nectar. They find that the easiest way out towards column and in taking this route they meet first the stigma, upon which they deposit any pollen they may be carrying, and then one of the stamens, the pollen of which they will remove. Vogal (1963) did some work on scent organs of orchid flowers and their relation to insect pollination. Until recently, scant glands were only known from animals. Luise Muller and Pohl recognised the lip of *Dendrobium nobile* as the scent source.

Except for some of the species of *Dendrobium*, *Habenaria* and *Aerides* most of the attractive flowers are not fragrant. According to Vogel (1963) *Cirrhopetalum ornatissimum* is furnished quite unusually with two heterogenous osmophores. The tails give rise to an odor like whale oil, while the lip smells of fresh herring. He has also mentioned that these antona like scent glands lure and pilot flies by their odour tail to the orchids hiding place amongst the tangle of epiphytes. Kullenberg and Bergstrom (1976) in their paper have mentioned about the pollination of *Ophrys* orchids. They studied the behaviour of the mele Hymenoptera by ocular observations as well as by electronic flash photography and 16 mm filming. According to them the flower perfumes attract the malas of certain species of *Hymenoptera aculeata* and induce them to perform movements resembling those performed during the copulatory attempt and during this period the pollinia is lessoned and pollination is accomplished. They have also mentioned that the different species of *Ophrys* are pollinated by different wasp e.g. *Ophrys speculum* by *Campsoscolia ciliata*, *O. insectifera* by *Argogorytes mystacous* etc.

In conlusion it may be mentioned that not much work has been done in India, on the pollination mechanism or pollination ecology of orchids, mainly for two reasons: (i) It is difficult for a botanist to identify a particular insect in the field; (ii) there is no co-ordination between the entomologists and the orchidologists in our country.

Constant observation is necessary to identify the insect pollinator e.g. it took fifteen years (Kullenborg and Borgstrom 1976) of field observation and experiments to identify the *Hymenoptera* males which pollinates *Ophrys* sp. In cultural conditions, most of the orchid flowers do not produce fruits due to lack of pollinators in the glass-houses to quote one exampls, *Dendrobium densiflorum* was introduced in Dehra Dun orchid house from Shillong and the probable reason for fuits not seting may be due to the absence of an effective pollinator. As the flowers exhibit a seasoual rythm the insects also have such a biological rythm and if this does not coincide with the plants, even though the insects appear at a later date the pollination will not be effected. This is perhaps what might have happened in case of this species.

According to Abraham and Vatsala (1981) the bee orchid i.e. *Cottonia peduncularis* common in Western Ghats, do not produce fruits due to the same reason.

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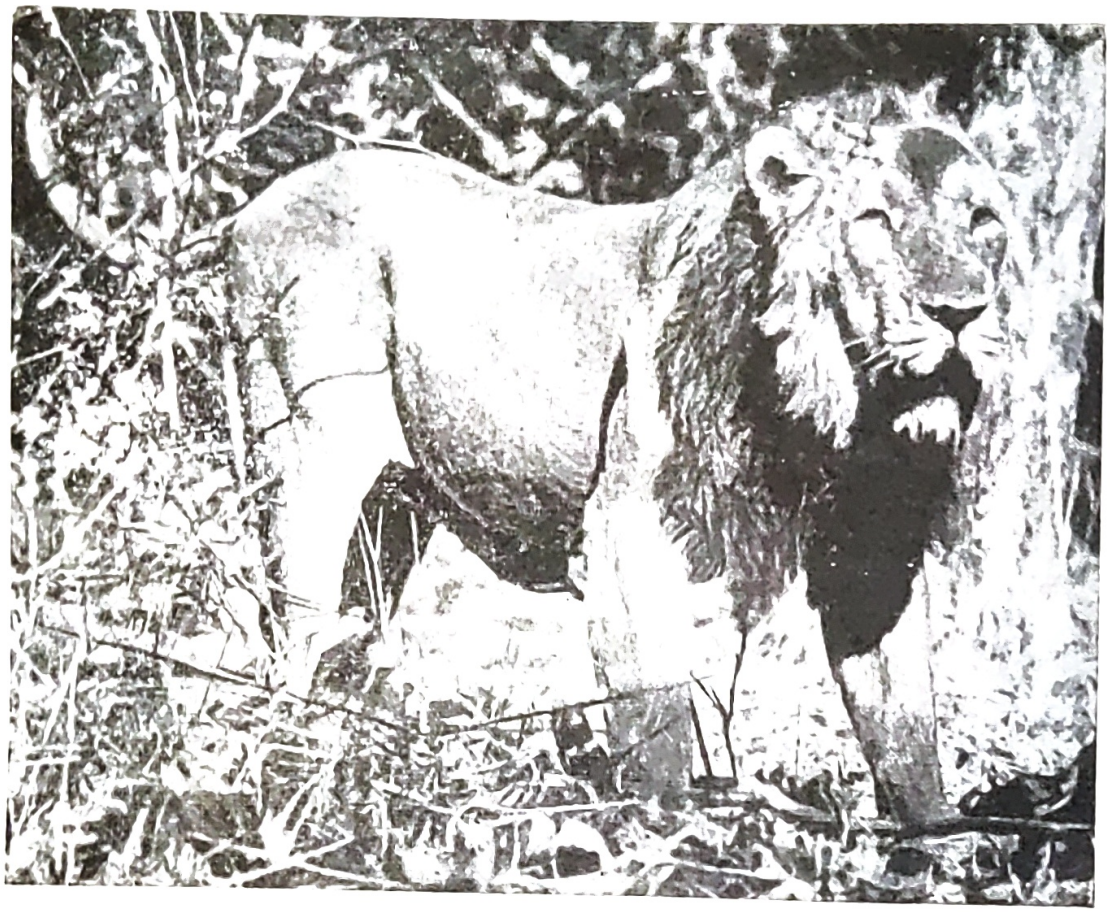

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